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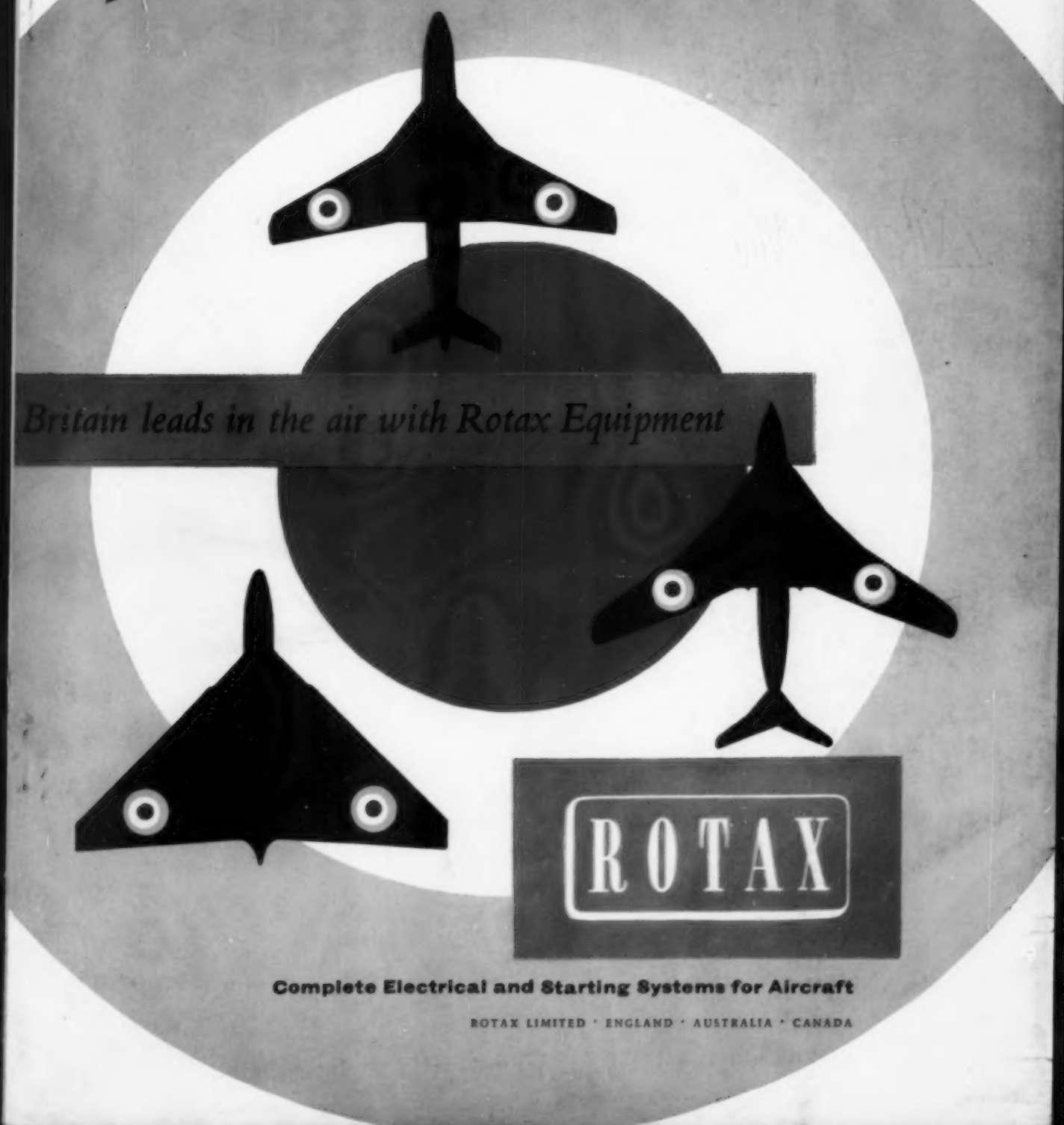
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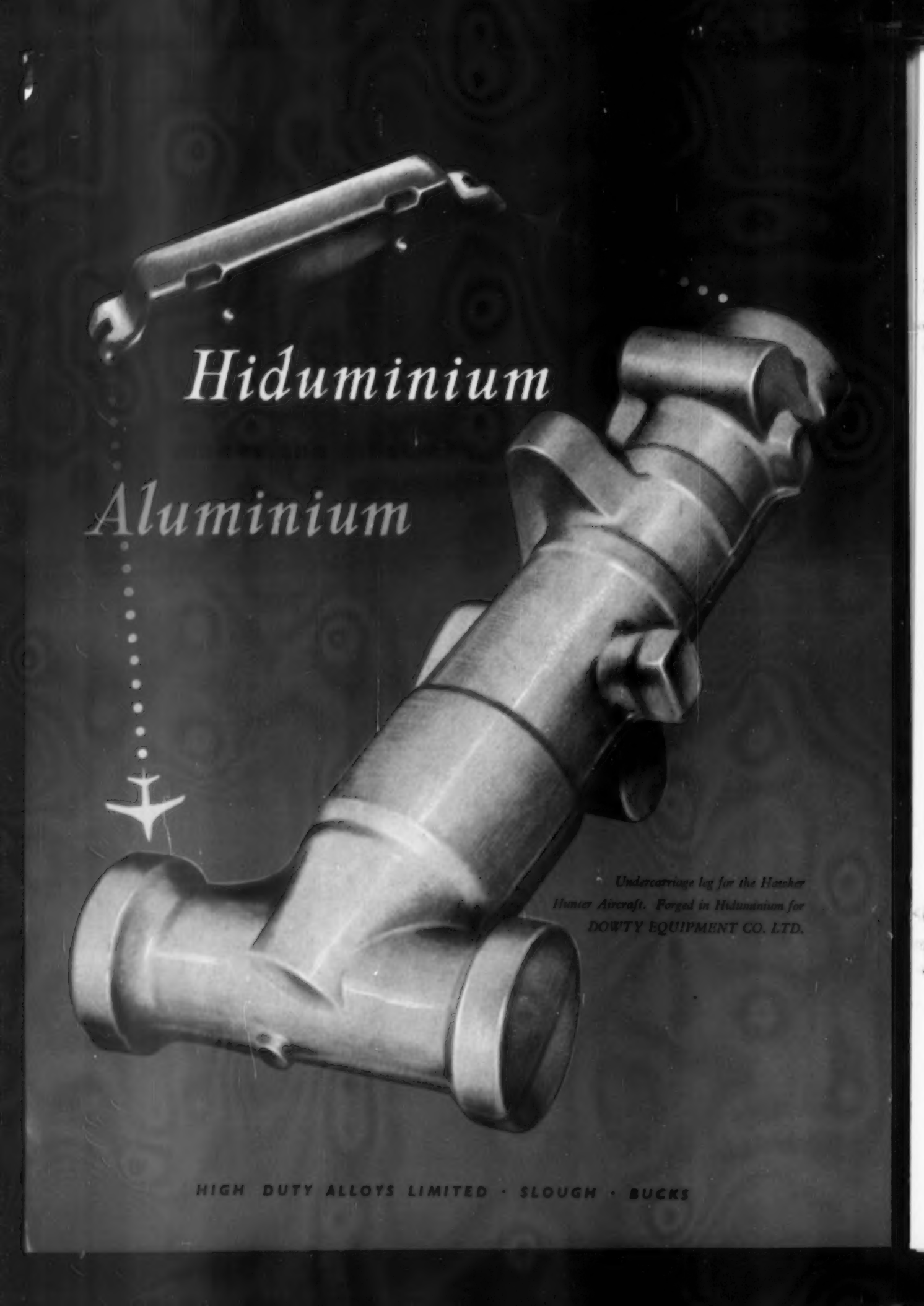

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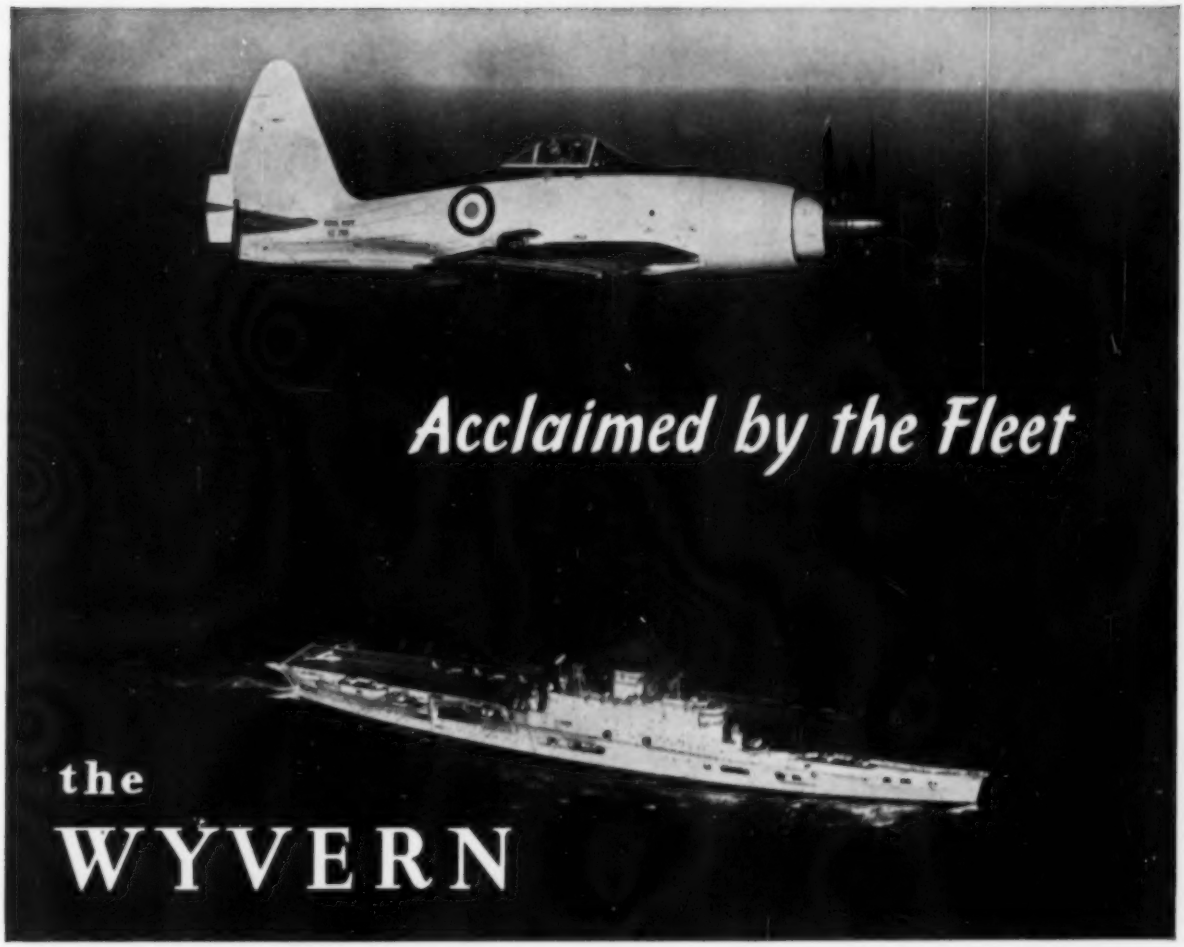

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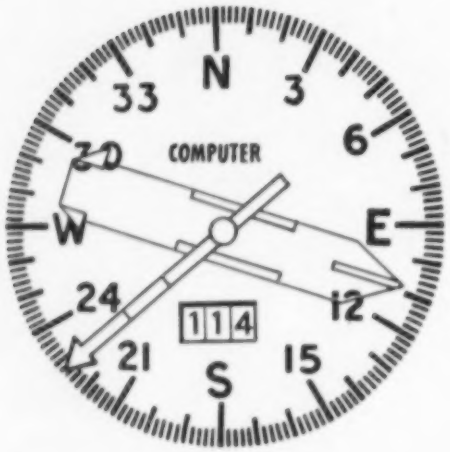

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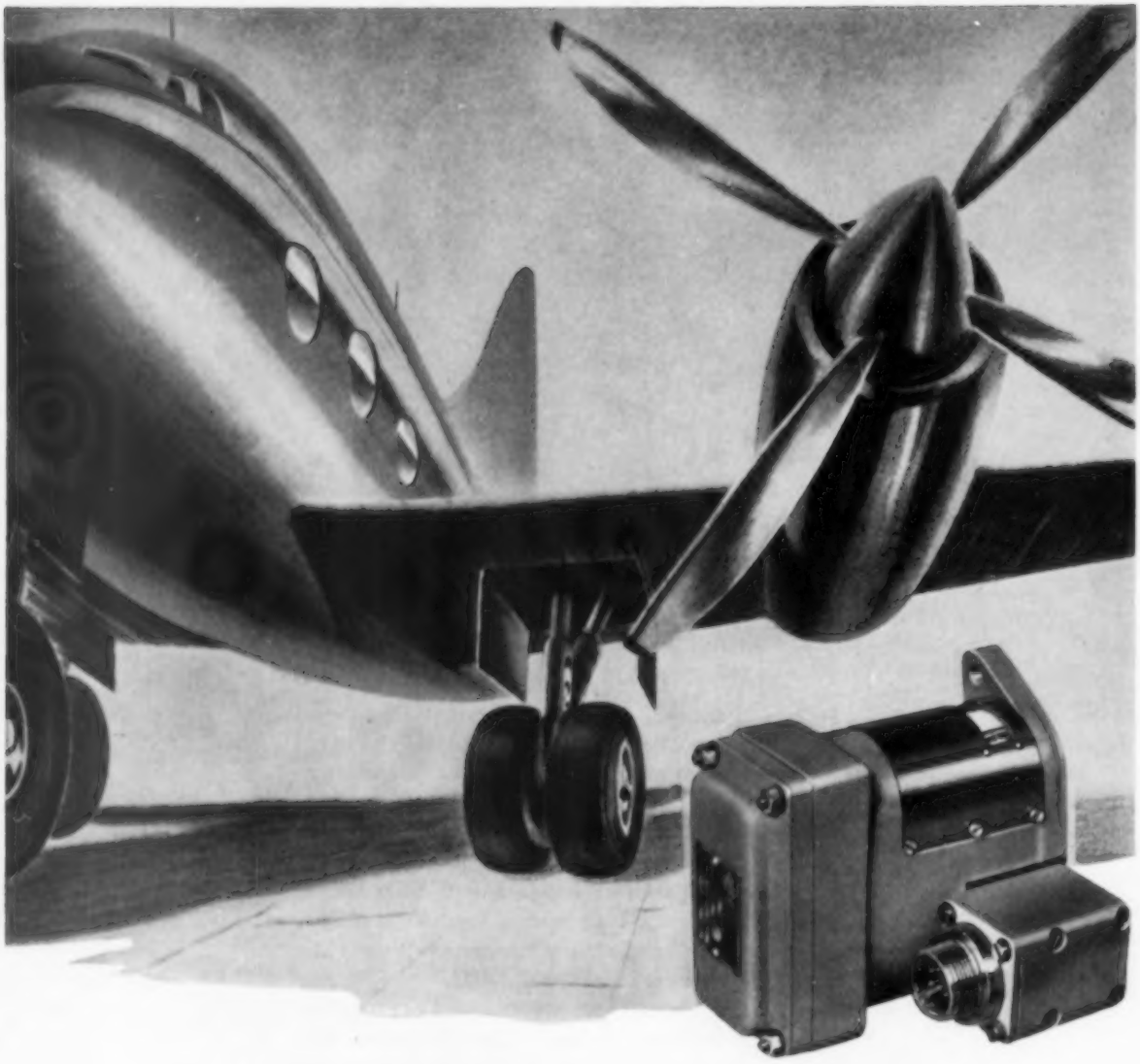

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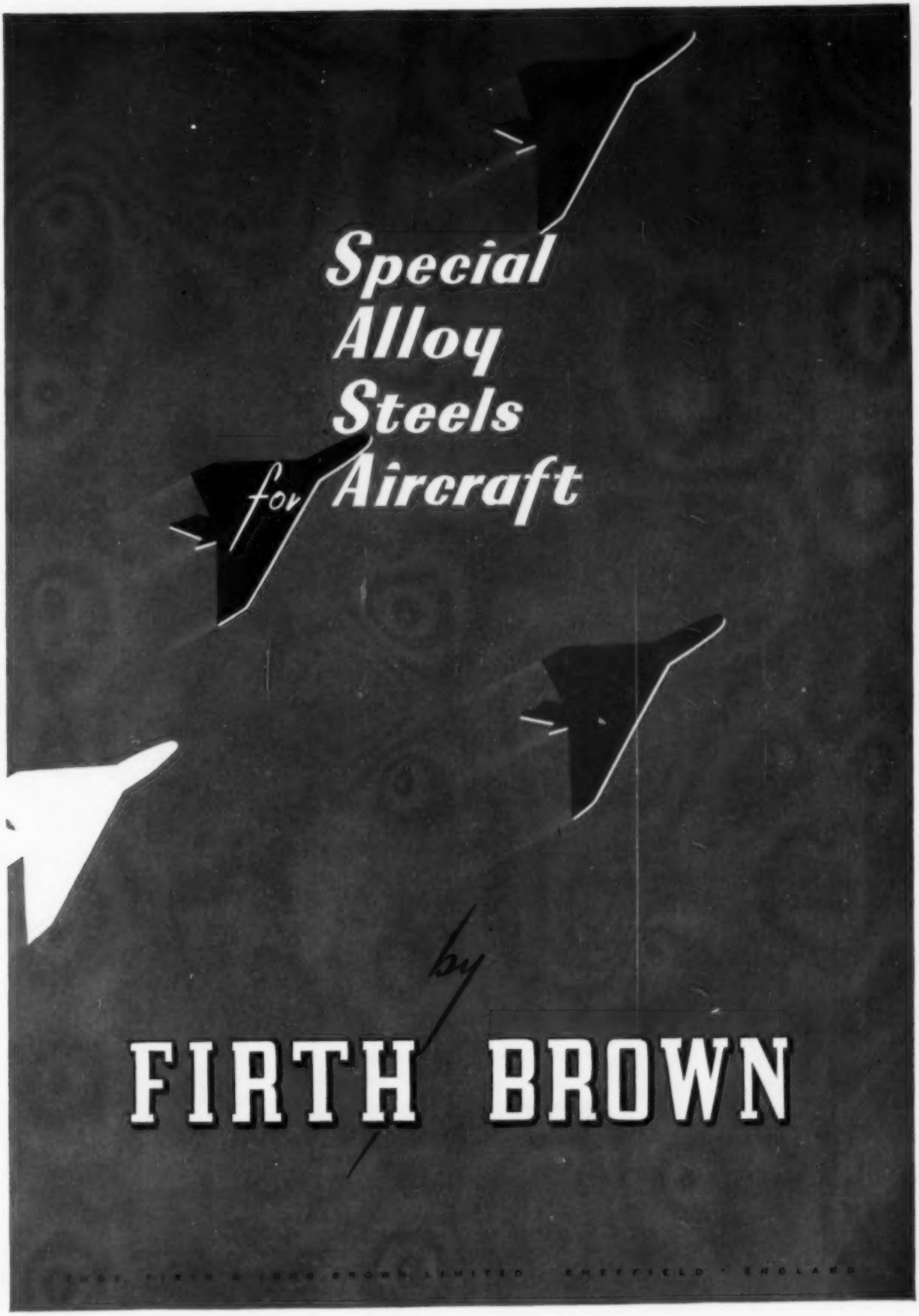
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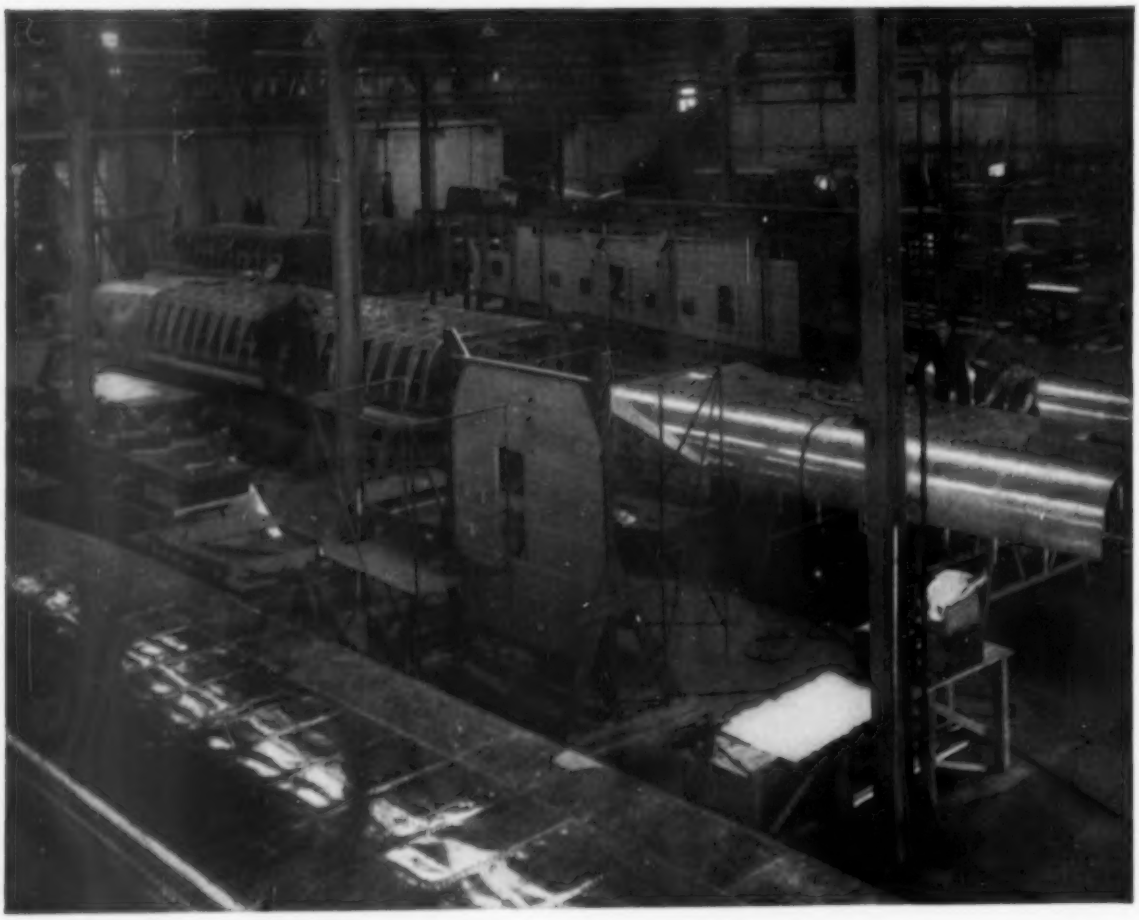

The above photograph is reproduced by courtesy of the Bristol Aeroplane Company, and shows their freighter units under construction in a section of our Aircraft Division

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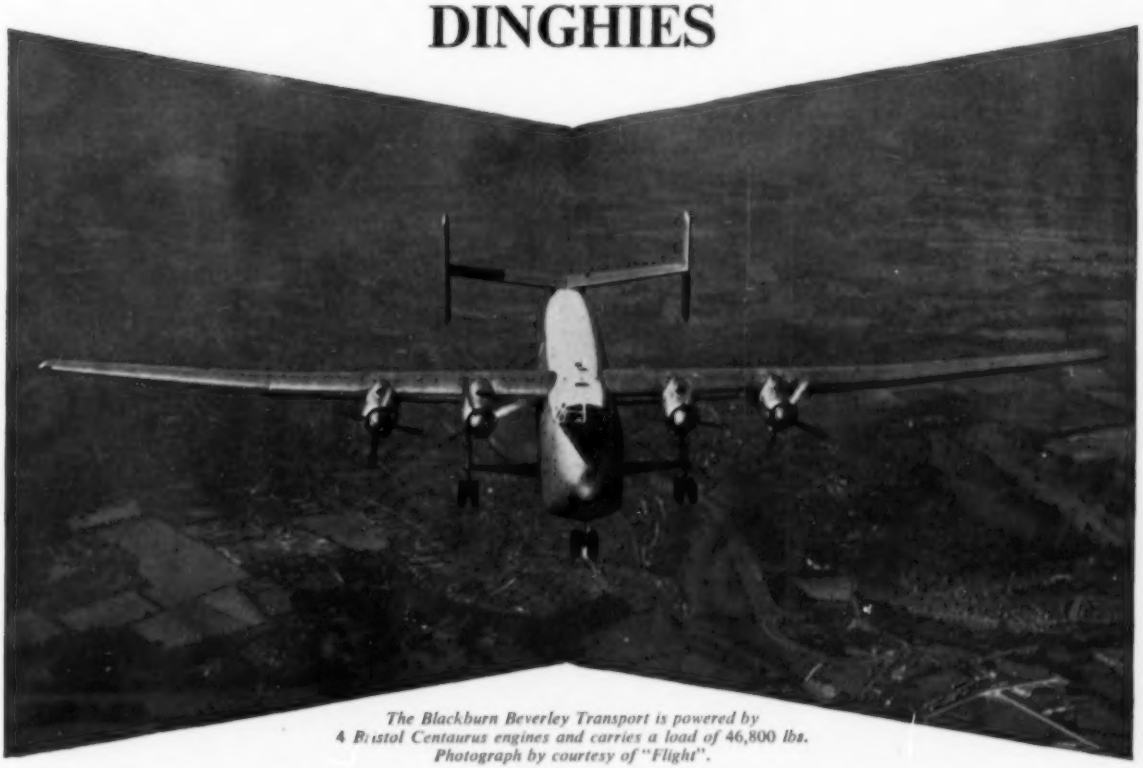

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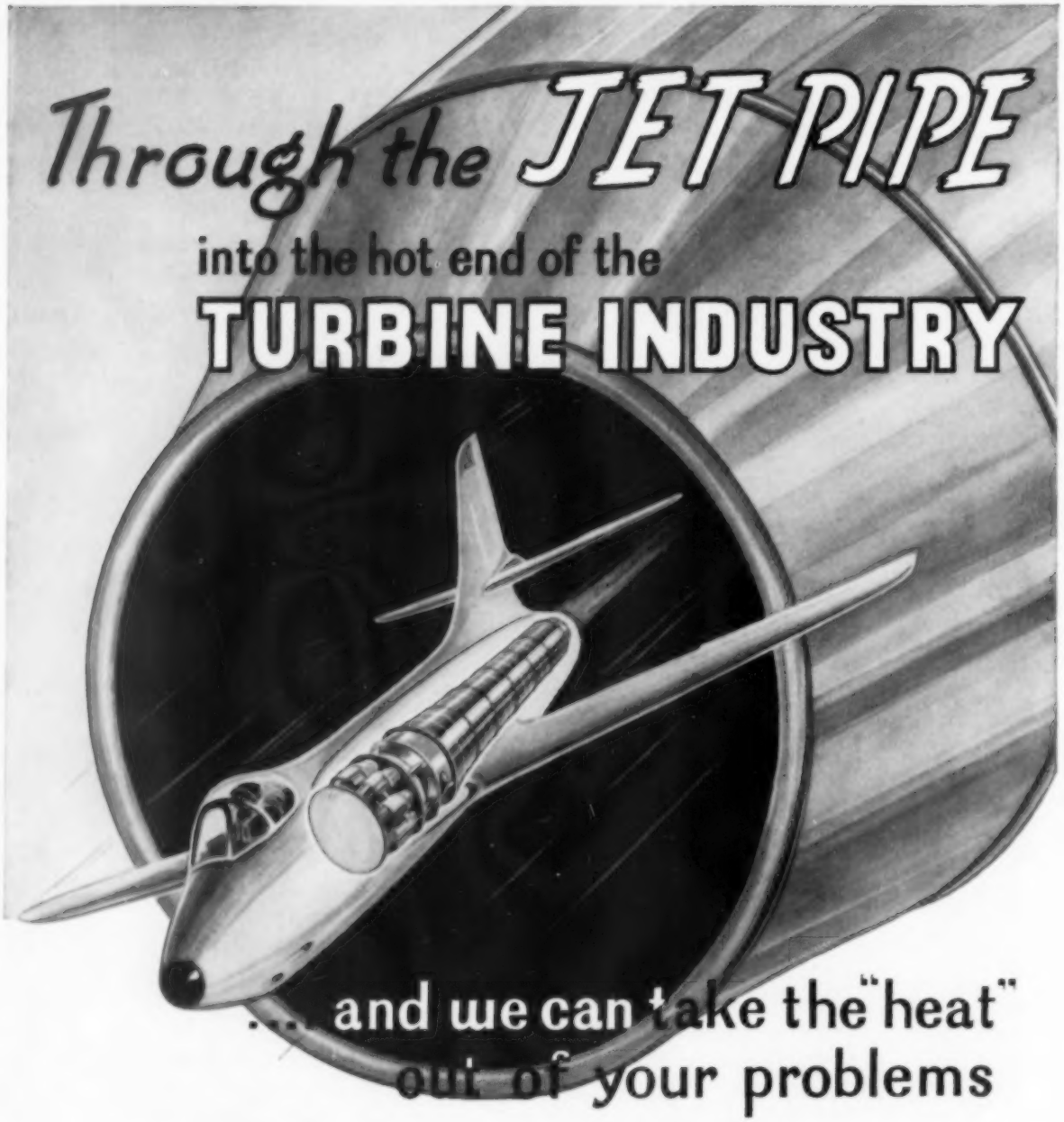

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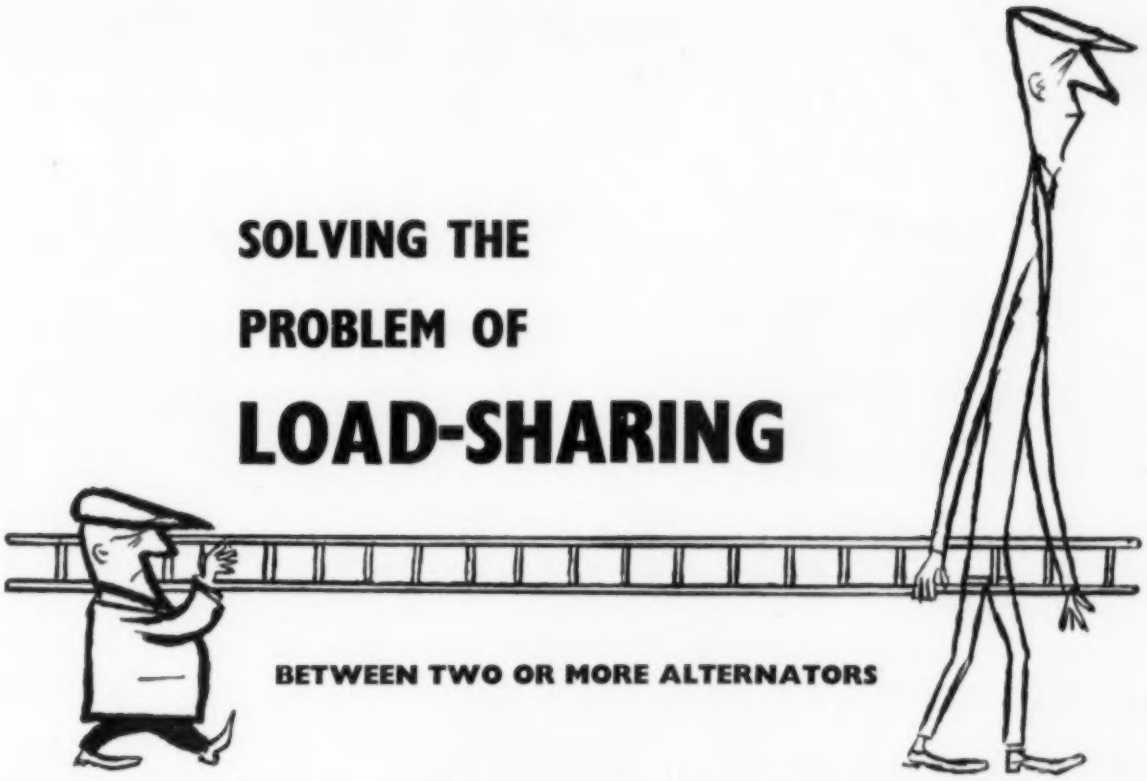

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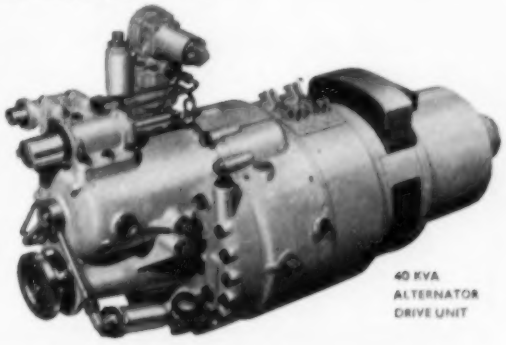

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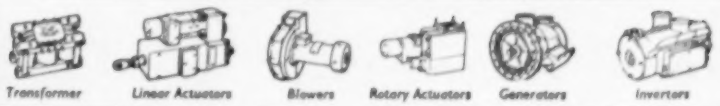

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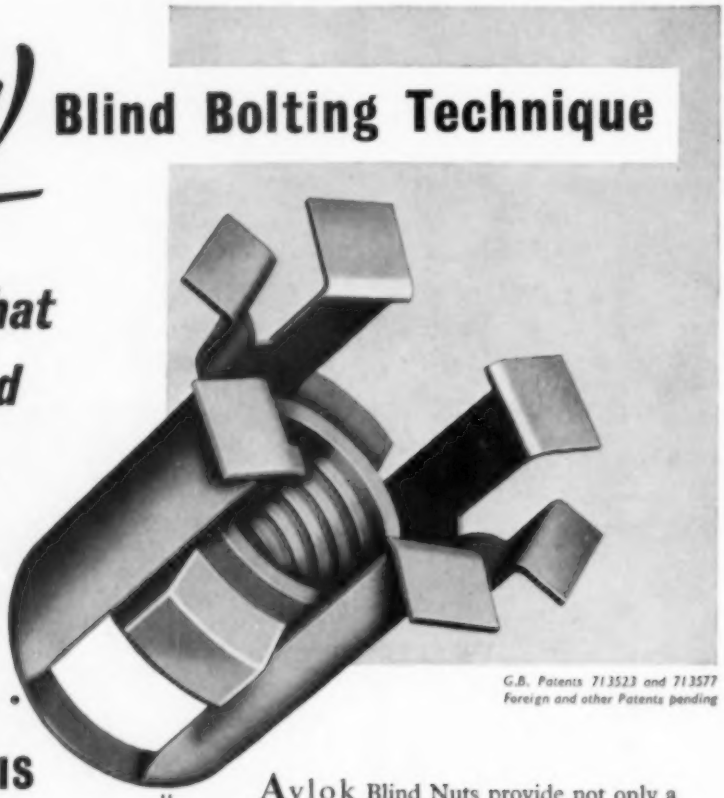

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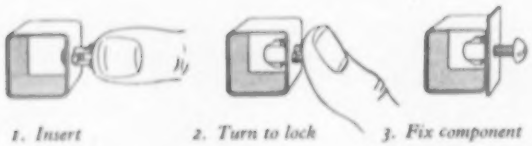

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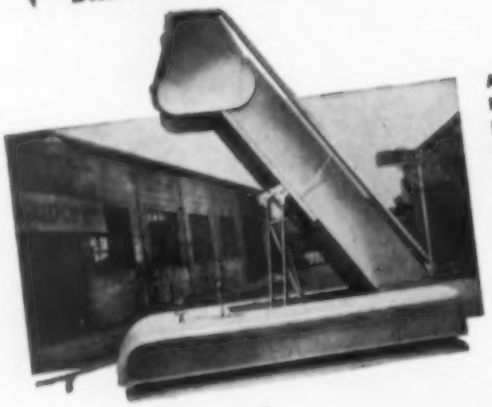
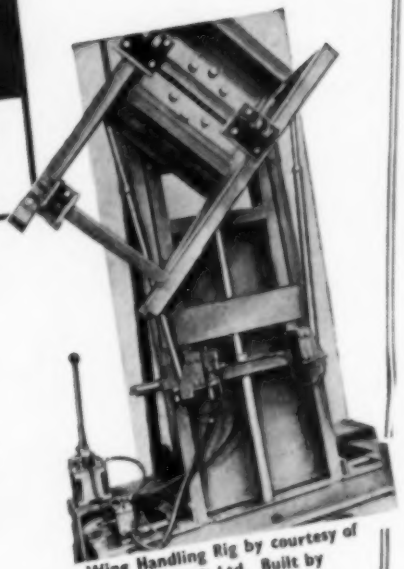


Aircraft Passenger Gangway by courtesy of B. F. Collingridge Ltd. Feltham, Middlesex



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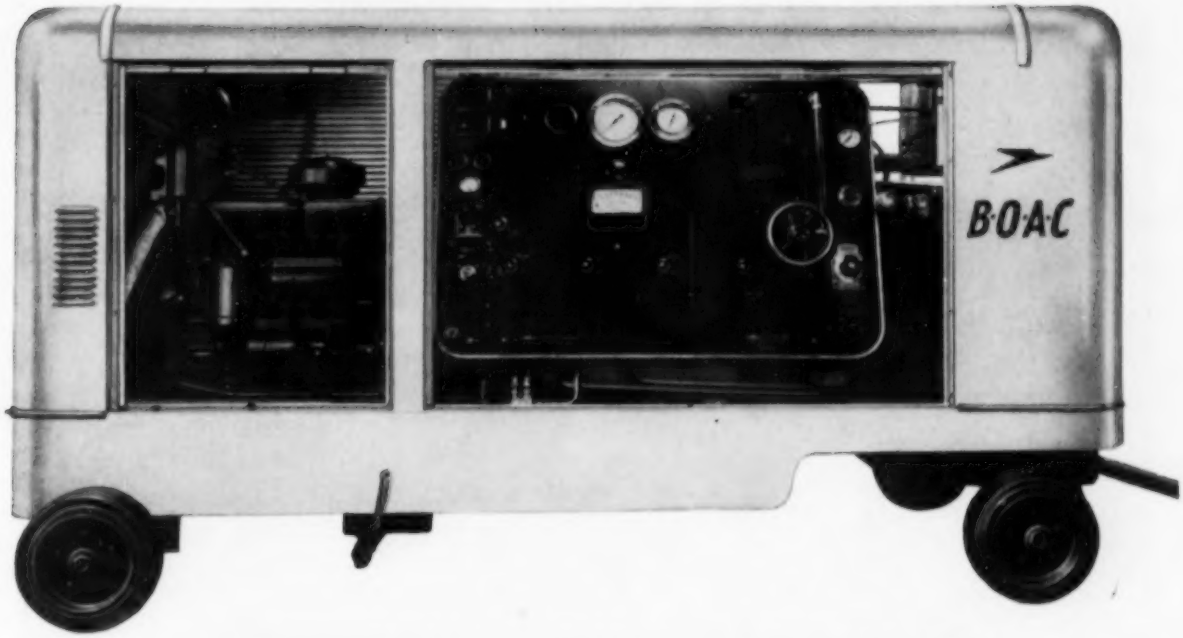

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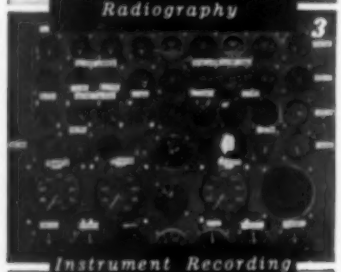

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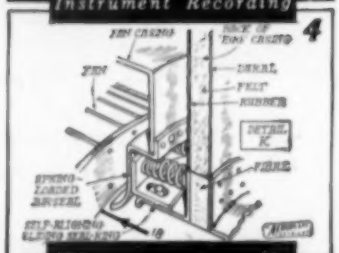

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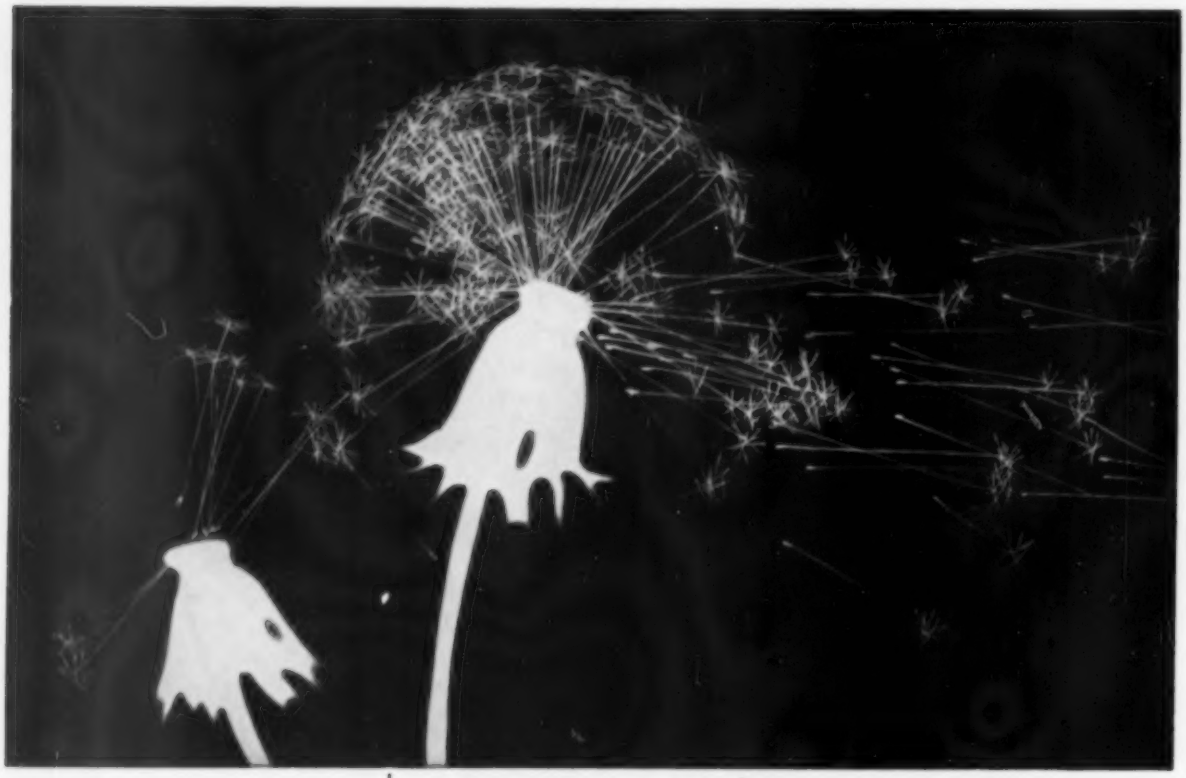

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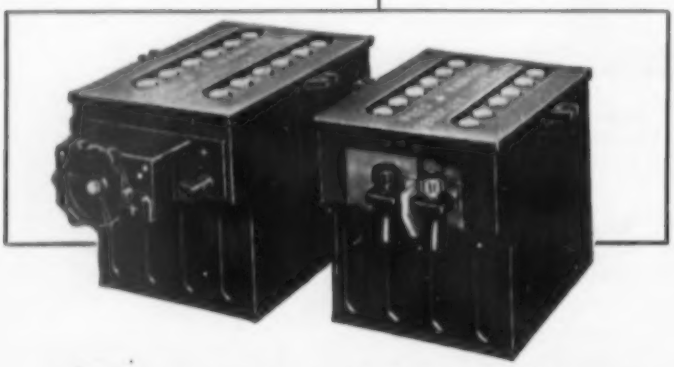

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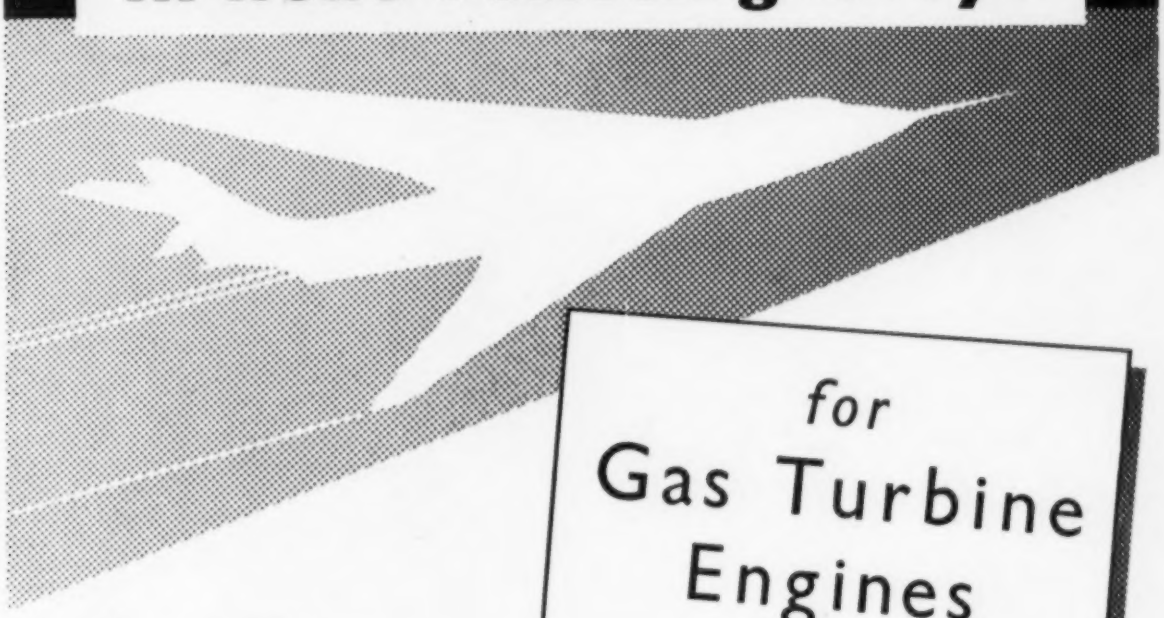

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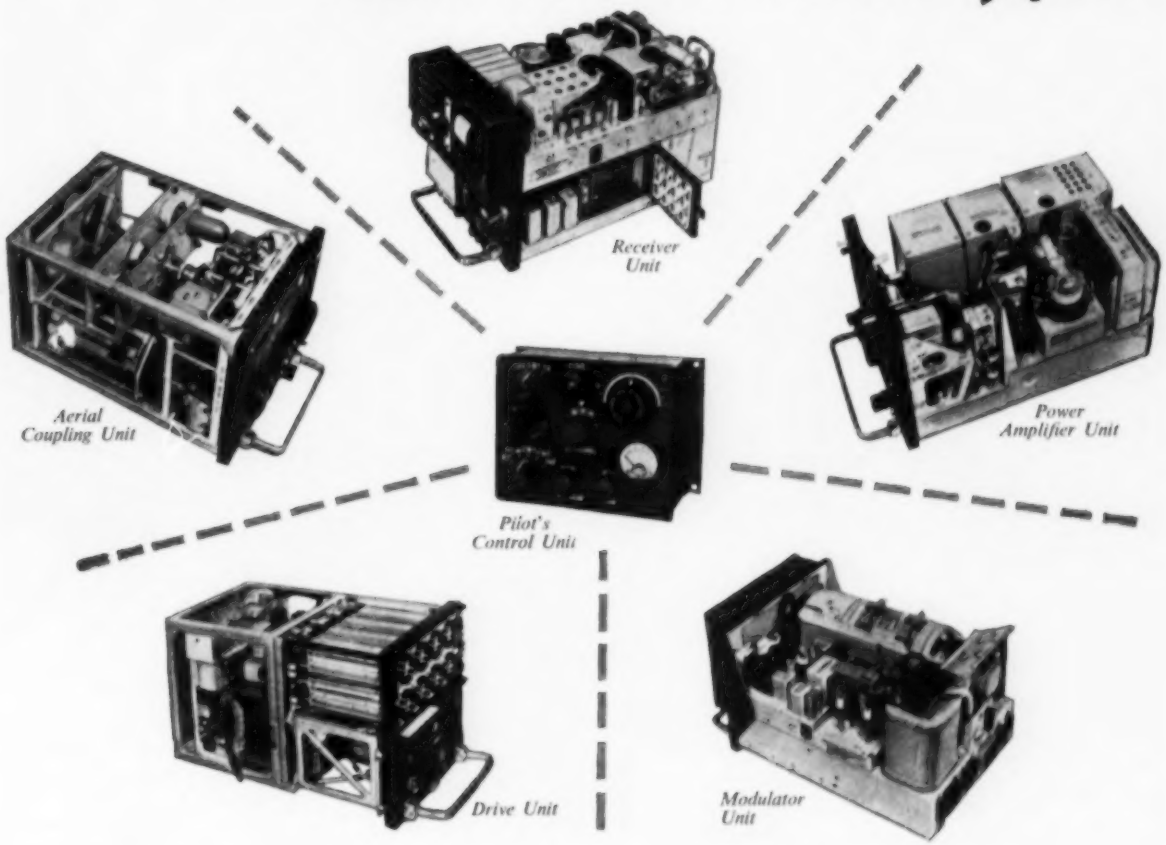

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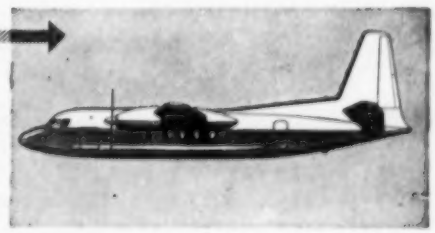

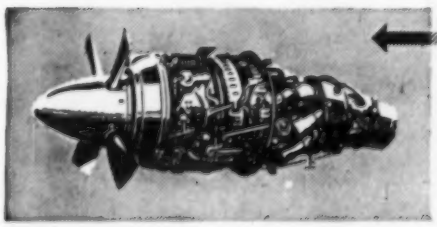

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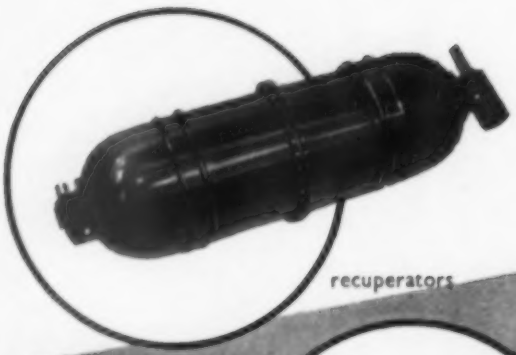

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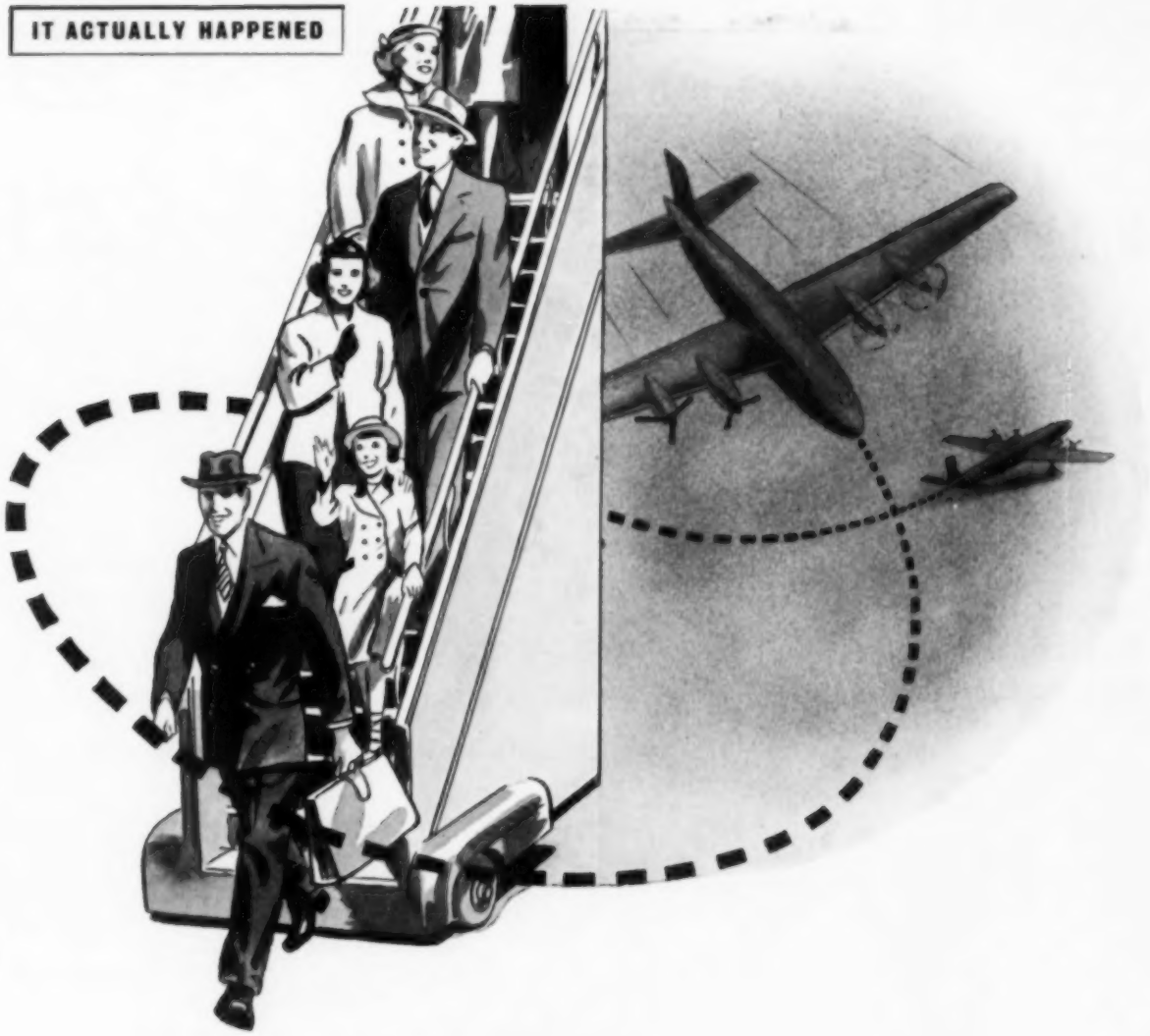

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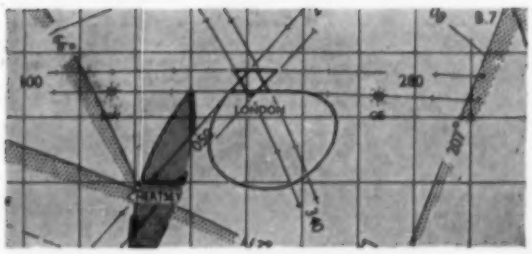

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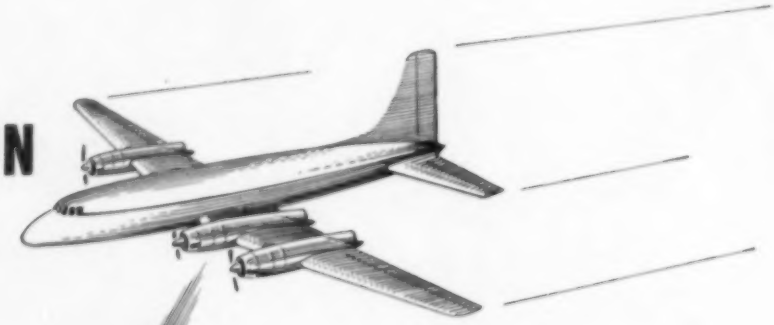

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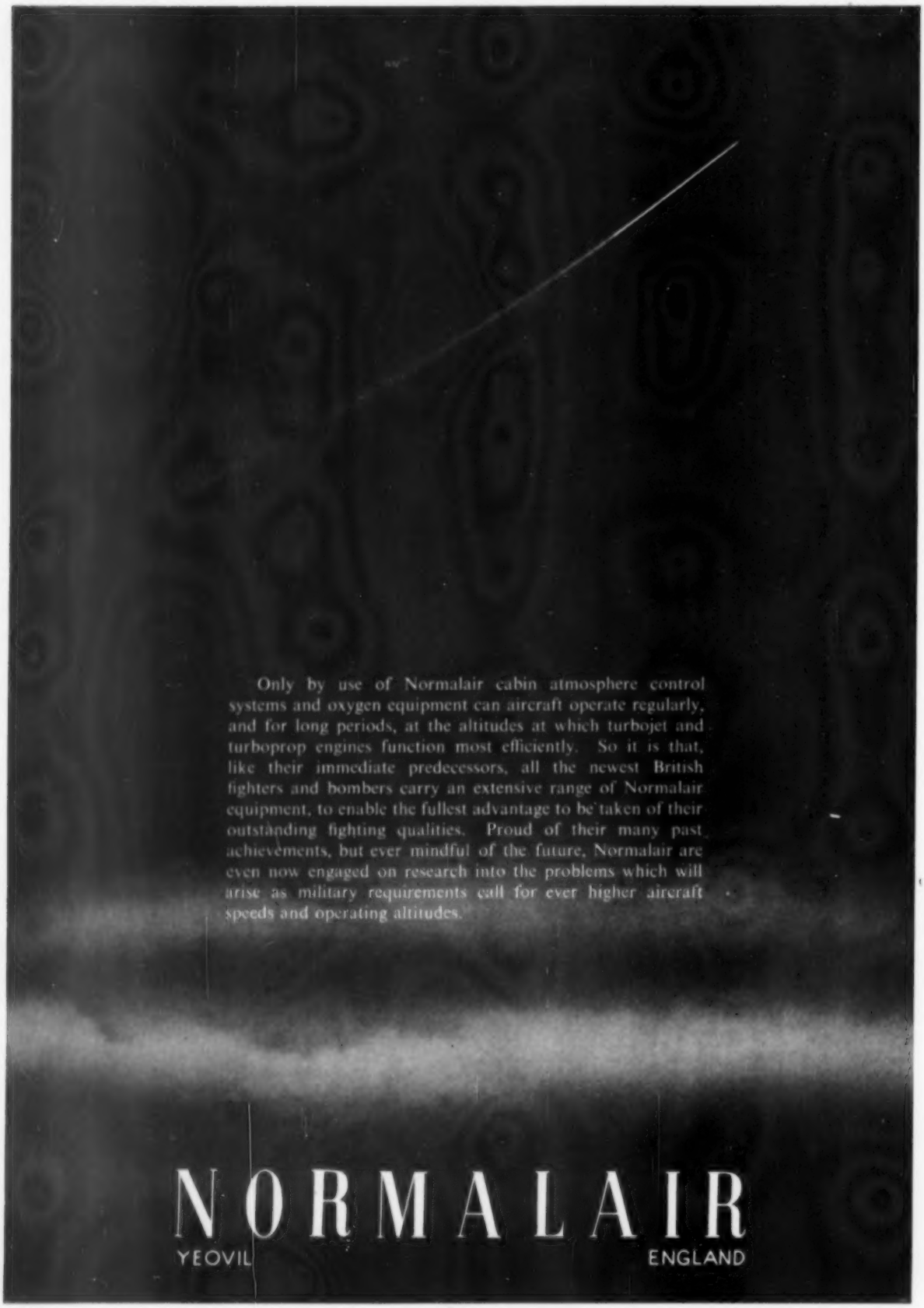
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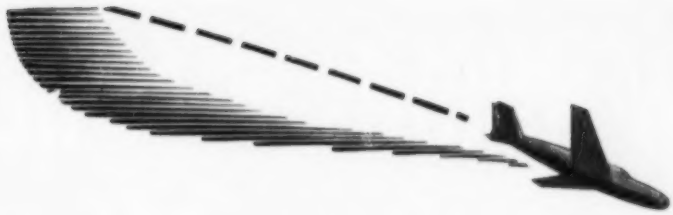

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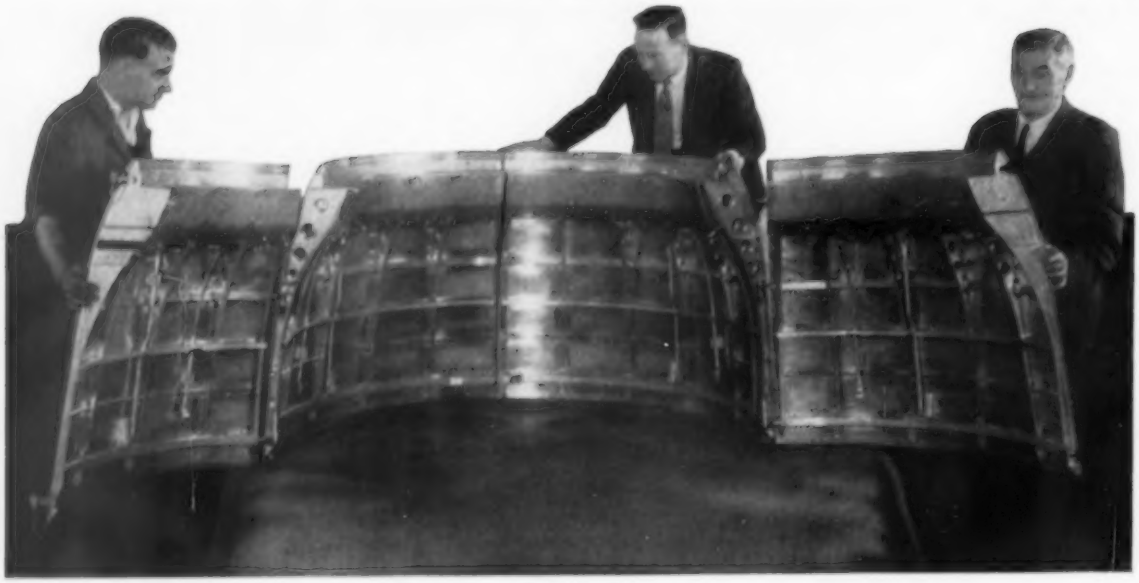

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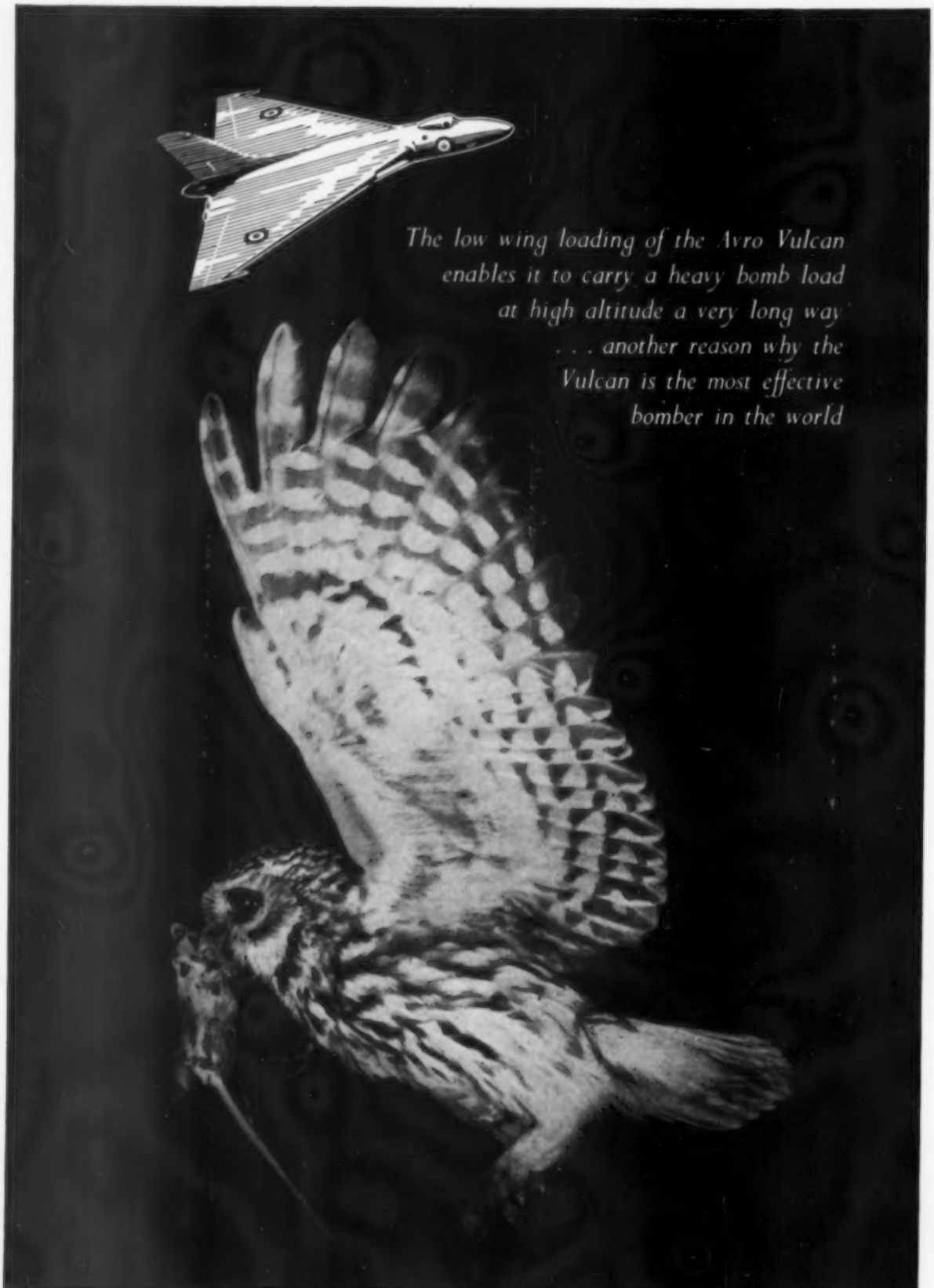
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Little Owl photographed by Eric Hosking. Taken by high-speed flash with a specially constructed set giving 680 joules with two lamps at an exposure of 1/5,000th second at f/45.

First Aeronautical Weekly in the World

FLIGHT and AIRCRAFT ENGINEER

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IN THIS ISSUE:

The Week's News - - 604
More Thoughts on Jet Lift - - - - 609
Routine Atlantic Crossing - - - - - 611
The World's Air Forces 615
1955 Military Aircraft Data - - - - - - 635
National Aircraft Insignia - - - - - 643
The World's Air Forces (contd.) - - - - - 639

Concerning this Issue . . .

THE times are fraught with fear and bedevilled by mistrust. Man's highest accomplishments are everywhere perverted towards his own destruction, and the terms air power and world suicide have become well-nigh synonymous. All this, alas, is beyond equivocation. But though "air power" may, in its broadest sense, have a reek of evil, there remains with "air force" a connotation of nobility, service and the finer qualities of manhood. There endure also the idea of an international chivalry, the inspiration of tradition, and the wholesome appeal of Service heraldry and arms. In no institution more than in the messes of an air force are there to be found physical and mental standards of a higher order, a stauncher loyalty, a livelier sense of humour, a healthier zest for adventure, a calmer contemplation of perils or a higher resolution to prevail over them. There is, too, that characteristic and laudable preoccupation with "shop"; one's own and the other man's equipment, methods and procedures, the newest technical developments and the finer points of tactics—all these are matters for regular and lively discussion.

If the present issue of *Flight* then, should call for a dedication, it is to the men of the world's air forces that this should rightly be addressed. They themselves are among our most diligent readers; and, though some part of what is written and depicted in these pages may to them be commonplace, the scope of our review is such that something new—even surprising—will surely come to their notice.

Our concern has not been with the great powers alone. Though the declared peace-time commitments of, for example, the Mexican Air Force may be more benevolent than militant, we nevertheless accord that Service a place with the awesome atom-forces, for the work of rescue and deliverance now falls increasingly to the lot of national air arms. By the same token, the humble Harvard is here, brushing wings with the mightiest jet bombers. The Spitfire, too, holds a place, along with collision-course interceptors; and even a Blenheim appears for Finland, though fifteen years of war and work have passed since it last saw Bristol. True, we might have sacrificed the Austers of the Arab Legion Air Force to the multi-jet Molochs of Russia and America; but for once, at least, might is not identified with right. The mass and menace of the great air fleets is, we consider, duly expressed by grim facts concerning their strength and dispositions. Interpretation of these facts, and action upon them, are matters for personal and political consciences, and we have refrained from super-imposing any commentary or criticism which might be considered to lie beyond our province. We have, however, seen fit to reproduce a contribution from NATO, dealing in the plainest terms with the defence of an ideological, as much as a geographical, frontier.

. . . and its Significance

On technical trends we ourselves may speak with equal directness. First we recognize the incomparable achievement represented by America's strategic bombing force, consistently and intensively exercised over vast distances, with the far-ranging aid of flight refuelling. We note America's insistence on day and night defence, with collision-course rocket armament soon to be superseded by air-to-air guided weapons; and we acclaim the manner in which the M.A.T.S. organization handles its vast logistic problems. Then we applaud the pioneer work of the American Forces in applying the helicopter to many forms of land, sea and air warfare. By Russian technical advances —especially by her fast jet bombers and the turbojets which have made them possible— we are much impressed, and we acknowledge the ingenuity and courage of the French in applying new techniques to fighters. Canada, Australia and Sweden we congratulate on having developed machines for their particular requirements.

As for our own nation, we contemplate with equanimity the progressive re-equipment of a Service which has never been the least among the world's air forces, and one to which so many others now acknowledge their indebtedness.

SUPERSONIC CLIMBER: The S.O. Trident, now with Armstrong Siddeley Vipers in place of Turbomécas. This remarkable aircraft, seen here with its rocket in action, has achieved supersonic speed on the climb, as recorded below.

FROM ALL QUARTERS

American Interest

THE president of Continental Airlines, Mr. Robert F. Six, said on arrival at London Airport on May 7th that he might buy up to 15 Viscounts if they proved suitable for his company's routes. Mr. Six's European tour includes visits to Vickers, de Havilland and Fokker. With headquarters at Denver, Continental Airlines operate DC-6Bs, DC-3s and Convairs over a 5,000-mile system of domestic routes.

Another American airline executive who has recently shown interest in European aircraft is Mr. Signard Wien, president of Wien Alaska Airlines. On May 5th he flew by B.E.A. "Clansman" service to Glasgow, having first paid a visit to the Fokker works at Amsterdam. This was Mr. Wien's first experience of turboprop travel, and he was much impressed. The following day he visited Prestwick to discuss the Twin Pioneer with executives of Scottish Aviation, Ltd.

Australia and the V-Bombers

REPORTS that Australia was considering the purchase of British V-bombers have been denied in Canberra by Australia's Air Minister, Mr. Athol Townley. "The matter of the purchase of these aircraft from Britain has not yet been considered, let alone contemplated," he said. According to an agency message from Canberra, the mission which recently returned from Britain and the U.S.A. has not yet reported to the cabinet, and when its report is eventually presented it will not lead to any immediate purchases. Purpose of the report is to form a basis for future buying.

Rock and Serpent

THE past few days have brought excellent news of Armstrong Siddeley turbojets in Continental airframes. From Switzerland came confirmation that the power plant of the P.16 fighter/bomber, illustrated in *Flight* of March 25th, is a Sapphire of over 8,000 lb thrust. The first prototype of the P.16, which is designed for an exceptionally short take-off run and high rate of climb, made its first flight a few days ago. From France it was learned that Armstrong Siddeley Vipers installed at the wing tips of the S.N.C.A.S.O. Trident research aircraft (prototype of a supersonic intercepter) have been used in conjunction with an SEPR liquid-fuel rocket to achieve supersonic speed, not only in level flight, but on the climb also. Another French intercepter designed to the mixed-power formula is the Marcel Dassault M.D.550, a delta, likewise with two Vipers and a rocket. Marcel Dassault hold the Viper licence.

D.H. Engines—New Chairman

IN succession to the late Major F. B. Halford, Mr. A. F. Burke, O.B.E., M.Inst.T., F.R.S.A., has been elected chairman of the board of the de Havilland Engine Co., Ltd. Mr. Burke was apprenticed in general engineering between 1922 and 1927, before joining the Airship Guarantee Company, where he remained until 1931, meantime taking part in the transatlantic crossing of the R.100. Four years later he joined Imperial Airways and played a major part in organizing and co-ordinating the Empire Airmail Scheme. On the formation of B.O.A.C. in 1939 he was appointed superintendent of technical development, serving in that capacity until the outbreak of war, when he was seconded to the M.A.P., under Lord Beaverbrook. His main activity was then the setting up and administering of the Civil Repair Organization. Later in the war, in addition to other duties, he became deputy managing director of D. Napier and Son, Ltd., where he worked with Major Halford. For his war work Mr. Burke was awarded the O.B.E. In 1943 he rejoined B.O.A.C. as assistant director-general (technical), remaining with the Corporation until November 1944, when he left to become director and general manager of the newly formed de Havilland Engine Company. In 1948 he became managing director (a position he will continue to hold) and was made a director of the de Havilland Aircraft Co., Ltd., in 1951.

Mr. A. F. Burke

Migs in Bulgaria

TO the tally of Russian aircraft supplied to the Bulgarian Air Force, as given on page 619, may now be added the Mig-15. This well-proven fighter has been extensively exported from, and licensed by, Russia, as the new Mig-17 has become available in increasing quantities to the Soviet Air Force.

Wyverns in "Eagle"

AN unusually pleasant and informal meeting between a manufacturing company and the Naval pilots who fly its aircraft took place at Littlehampton on Sunday last. The occasion was an eve-of-embarkation dinner-dance held for the pilots of two Fleet Air Arm Wyvern squadrons by Westland Aircraft, Ltd., whose board was represented by Mr. D. L. Hollis Williams (technical director). The squadrons concerned—Nos. 813 (Lt-Cdr. R. M. Crosley, D.S.C.) and 827 (Lt-Cdr. S. J. A. Richardson)—will remain aboard the *Eagle* until this year's autumn exercises. No. 827 embarked early this week, and No. 813 will join the ship (lately fitted with an interim angled deck and mirror sight) in a few days' time. Deck-landing training in the Portsmouth area is the first part of the *Eagle's* programme.

Those who attended the Littlehampton dinner were left in no doubt as to the Wyvern pilots' confidence in their equipment. By comparison with previous carrier-borne single-seaters, the Wyvern is a massive and complex aircraft; nevertheless, young and relatively inexperienced pilots ("straight from the training pipeline") have been converted to the type with a minimum of trouble. Wyverns are reported to be extremely stable in I.F. conditions, and have lately achieved an impressive serviceability record.

GETTING DOWN TO IT: Now regularly flying from the Royal Aircraft Establishment, Farnborough, under the direction of the Institute of Aviation Medicine, is the Armstrong Whitworth prone-pilot Meteor, the characteristics of which are admirably shown in this intimate view.

OUT WITH THE TULIPS is this first Fokker-assembled Hawker Hunter. At the controls on the first flight was Gerben Sonderman, the company's chief test pilot, a new portrait of whom appears on page 607.

B.E.A.'s First Profit

DURING the financial year which ended on March 31st, 1955, British European Airways operated at a net profit for the first time. This satisfying news was revealed this week by Lord Douglas, B.E.A.'s chairman, who said that the Corporation made a gross profit of about £¼m; subject to audit, the net profit—after payment of £654,000 interest on capital—would be some £50,000. Major contributing factors to this small but significant profit were the fleets of Viscounts and Elizabethans, coupled with a resolute economy drive whereby the budget was beaten by no less than £750,000.

Russia's "Jet Freighter"

A JET freighter, designed by Ilyushin and known as the Il-20, is reported to have been introduced on Russian internal routes. First mention of the new aircraft was made by Moscow radio, who stated that it "is now being used for carrying to Sverdlovsk and Novosibirsk of matrices of *Pravda, Izvestia, Krasnaya Zverda* and other Moscow newspapers, so that readers 3,000 km away in Novosibirsk may get their morning newspapers at the same time as Muscovites."

Westland Flight-test Appointments

SINCE his secondment to Westland Aircraft in August 1953, Lt. W. H. ("Slim") Sear has acted as the company's chief test pilot; now, on his retirement from the Royal Navy, he is confirmed in that appointment. Westlands simultaneously announce the appointment as assistant chief test pilot of Lt-Cdr. Roy S. Bradley, who joined the firm as an experimental test pilot in 1950.

Lt. Sear, who completed the 1951 course at the Empire Test Pilots' School, transferred to the Fleet Air Arm in 1945 after three years' service with the R.A.F. He subsequently served with Nos. 891, 812 and 816 Squadrons, and after completing an instructor's course at C.F.S. was appointed Naval instructor at R.A.F. Syerston. Lt. Sear has flown 46 types of aircraft and is the holder of a Silver C sailplane licence.

Lt-Cdr. Bradley, who served in the Air Branch of the R.N.V.R. from 1941 to 1946, has flown 42 types of aircraft and has almost completed 1,000 hr on helicopters.

A.W.A.'s Sea Hawk Production Cut

THE Minister of Supply was asked in Parliament last week if he would make a statement on the changes in his production programme at Armstrong Whitworths, Baginton, Coventry, which were causing a redundancy of 200 workers.

In a written reply, Mr. F. J. Erroll, Parliamentary Secretary, said that Armstrong Whitworth Aircraft, Ltd., at present manufactured at its Baginton works, Sea Hawk and Hunter fighters against Ministry of Supply and American off-shore contracts. The Admiralty had recently decided to reduce slightly its total requirements of Sea Hawk aircraft, because new equipment and techniques, such as the mirror landing sight and the angled deck on its aircraft carriers, would materially reduce the accident rate and consequent wastage of aircraft in service. As a result of this cut in requirements, Armstrong Whitworth Aircraft's production of Sea Hawks finished a few months earlier and the firm had dismissed about 150 workers, and might reduce its labour force by a further 50 in the near future. Mr. Erroll thought that the men would have no difficulty in finding employment with other firms in the Coventry area engaged in work of national importance.

CONVERTED: The first conversion from rotary-wing sustenation to conventional flight is claimed for the McDonnell XV-1. The rotor is driven by pressure jets, supplied by compressors driven by a Continental piston-engine. The same engine drives the pusher propeller.

The Pathfinders Entertain

THE Pathfinder Association held its annual dinner last Friday, May 6th, at the Dorchester Hotel, London, with the president, Dr. J. C. MacGown, D.F.C., in the chair. As usual, several important guests had been invited, amongst them Col. John Marchant, U.S.A.F., United States Assistant Air Attaché, who ably and gracefully proposed the toast of the R.A.F. He mentioned the pride with which ex-members of the Eagle Squadron still wore their R.A.F. wings on their right-hand breast.

Replying to the toast, Air Chief Marshal Sir Francis Fogarty, K.C.B., K.B.E., D.F.C., A.F.C., illustrating his contention that national weakness was an invitation to war, referred to the relative strength of Germany at the outbreak of both the Kaiser war and the Hitler war. In contrast to the Allied position then was the deterrent power of the U.S.A.F. and the atomic bomb today. The United States Air Force had held the peace since the Battle of Britain. Today it was a political and economic battle that was being fought. Sir Francis concluded his brief remarks by referring to the Pathfinders, who, he said, had set the standard which Bomber Command followed today. There was a difference, however, in that each individual crew of the new bombers had to be super Pathfinders.

Mr. Alex Thorne, D.S.O., D.F.C., secretary-general of the Association, amused everybody by his lively proposal of "The Guests"; and there was agreement with his praise of guests from the film industry for their treatment of *The Dam Busters* (the world premiere is in London on Monday next). The subject, said Mr. Thorne, had been treated with the realism and dignity which the Pathfinders felt it deserved.

Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C., replying for the guests, said that the work of the Pathfinders represented a short and glorious phase in the war. No one would ever try to do the work again, so it followed that no one would be able to do it better. Today each bomber would carry a load equivalent in effectiveness to that of 20,000 war-time Lancasters, and each one would go alone.

As is customary on these occasions, a final toast was that of "Absent Friends"—proposed by Mr. Donald Nelson, D.F.C.

Bristols' Chairman Retiring

CHAIRMAN of the Bristol Aeroplane Co., Ltd., for the past 27 years, Sir William Verdon Smith, C.B.E., has stated that he intends to retire from the chairmanship after the annual general meeting on May 27th. Sir William, who is 79 years of age, has accepted the invitation of his colleagues to remain a member of the Board.

The Board has announced its intention to appoint Sir W. Reginald Verdon Smith, one of the joint managing directors, to the position being vacated by his father.

Sir Stanley White, who was managing director until 1952, will continue as deputy chairman and Sir Reginald Verdon Smith and Mr. George White will retain their present appointments as joint managing directors.

Sir William's own announcement of his intention to retire from the chairmanship is contained in his statement on the company's progress for the year ended December 31st, 1954, published in

FROM ALL QUARTERS . . .

advance of the annual general meeting to be held on May 27th. This statement reports a net profit for the year of £798,588, compared with £582,661 for the previous year, an increase of £215,927.

In a detailed review of the company's activities mention is made of the steps taken to overcome difficulties caused by shortage of labour. Helicopter production has been transplanted to the Weston-super-Mare factory; the engine division has branched out on the North-east coast; nearly the whole of the components for the Freighter and many of those for the Britannia have been sub-contracted; even the Sabre repair line undertaken for the R.C.A.F. in Europe has now been sub-contracted (to Scottish Aviation, Ltd., at Renfrew); and branches of the design offices have been opened in London.

Despite these measures, continues the statement, the prospect of establishing a major production line of large transport aircraft at Filton had continued to be a problem, and the company therefore welcomed the opportunity of being able to take a share in the business of Short Brothers and Harland, Ltd., at Belfast.

Other points from the statement are as follows:—

Of the Britannia: ". . . the results promise to exceed our highest hopes and we can now say that our original confidence in the Britannia aircraft at the design stage has received renewed confirmation at each successive stage of development."

"The helicopter section . . . went ahead well. Increasing production orders for the single-rotor Sycamore absorbed our available capacity, and development of the experimental twin-engined, twin-rotor type proceeded urgently for the Royal Navy and Royal Air Force."

Sir William Verdon Smith.

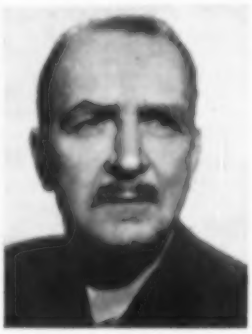
Sir Reginald Verdon Smith

"The growing range of work undertaken by our aircraft division has included the development and manufacture of rocket-motor tubes for various guided weapons and of plastic drop tanks for fitting to a number of military aircraft."

Of the Orpheus engine: "Its attractive power/weight ratio may well have a considerable influence upon the trend of aircraft design, and it is scheduled for installation in the Folland Gnat and in a number of aircraft now being developed for NATO use. It is our hope that its simplicity and ease of manufacture will make it especially suitable for licensed manufacture overseas."

LOUIS BRÉGUET

BY the death of Louis Bréguet the world loses almost the last of the legendary figures of the pioneer days of aviation in France. Seventy-five years of age, the managing director and chief engineer of the Bréguet company died at his Paris home on May 4th.



M. Bréguet

Few if any men in the aeronautical industries of any country can have maintained such an unbroken record of inventive and productive ingenuity. Born in 1880, the son of a manufacturing electrical engineer, he began his aeronautical experiments while he was in his early twenties. A measure of success crowned his efforts in 1907 with, remarkably enough, a helicopter. In *Flight's* predecessor, *The Automotor Journal*, for September 21st, 1907, we read of the experiment which was made by Louis Bréguet in collaboration with his brother, Jacques, and a man named Richet: "The apparatus consists of four propellers in a nearly horizontal plane driven by a 40-h.p. engine and, as the framework was incomplete, an armchair was harnessed up for trial purposes. Although weighing about half-a-ton it is stated that the machine lifted itself and the aeronaut easily into the air—'four men being required to hold it down'."

It was not long before Louis Bréguet achieved success with a fixed-wing aeroplane; and it was a machine which, both in design and construction, was considerably in advance of contemporary thought. The most striking departure in this biplane was the use throughout of a tubular-steel structure and of thick wings formed from tubular spars and aluminium ribs; fabric covered, the wings had sheet-metal leading edges. Though of the then-conventional four-tail-boom configuration it had its engine and airscrew mounted in the nose and was, in fact, one of the first successful tractor aircraft.

A number of other biplane designs followed, and only two years later, in August 1910, Bréguet succeeded in taking five passengers aloft. He also broke a number of distance and load-carrying records.

In 1911 he began what was for that period large-scale manufacture of aircraft and during the next two years he produced a seaplane, together with a number of aircraft that before long were to prove their value for military purposes. Outstanding among these was the Bréguet 14 reconnaissance biplane, which in various sub-types was produced in large quantities. Louis Bréguet himself served for a time as a pilot in the French Air Force and was awarded the *Croix de Guerre*.

In the immediate post-war period, and still remaining faithful to all-steel construction, he designed the Bréguet 19; manufactured in large numbers, it secured many records for long-distance flying. In the late 1920s he turned his attention to the cleaning-up of structures to reduce drag, the result being a series of biplanes and sesquiplanes (biplanes with a very small lower wing) in which inter-wing bracing wires were entirely eliminated.

The 1930s saw the progressive development by Bréguet of single- and twin-engined military multi-purpose aircraft, three-engined commercial machines and—after the acquisition of a Short Brothers licence—civil and military flying-boats. For new types of multi-seat fighter and commercial machines, he turned to the low-wing monoplane. In 1936 his factories were absorbed into France's nationalized aircraft industry, but three years later the company acquired three plants from the Latécoère organization.

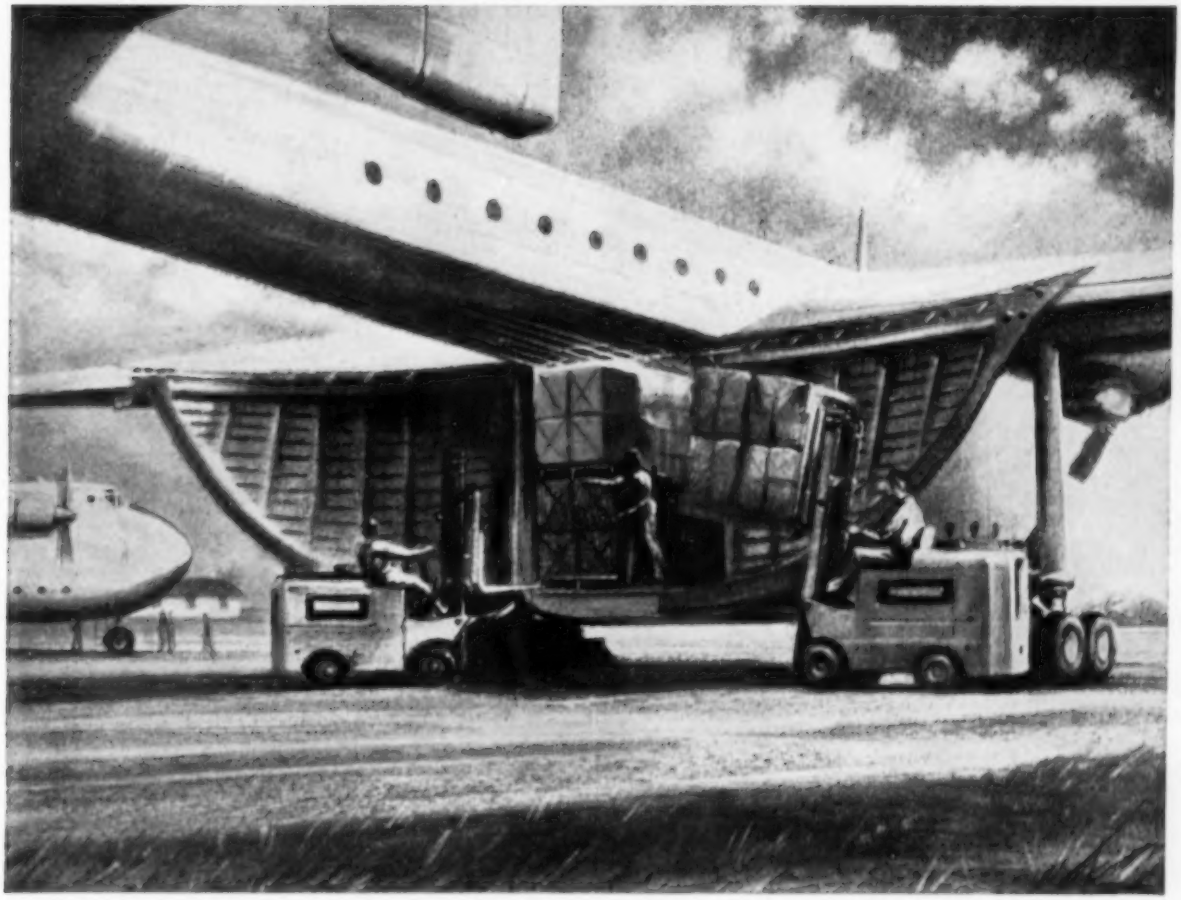
In post-war years the Bréguet company has built large military flying boats, twin-engined commercial aircraft, a four-engined bomber, helicopters, sailplanes, naval strike aircraft and—most successfully—four-engined freighters of the Deux Ponts type. On page 610 of this issue reference is made to the latest developments by a company which, inspired by the originality of its leader, has always been noted for its technical ingenuity.

ENGLISH ELECTRIC APPOINTMENTS

THE English Electric Co., Ltd., announce that Mr. James William Adderley, M.B.E., B.A., A.F.R.Ae.S., has been appointed sales manager of their aircraft division. He joined the technical sales side of that division in October, 1952.

After leaving Cambridge with a first class honours degree Mr. Adderley joined the R.A.F. in 1941 and later worked in the Ministry of Aircraft Production on gas-turbine development. Before joining English Electric Mr. Adderley was technical representative in England of A. V. Roe (Canada), Ltd.

Turning to another aspect of current English Electric activities, it will be remembered that last week, in reproducing an air-to-air photograph of the English Electric P.1 we mentioned that Peter Hillwood was carrying part of the load of testing. Though Mr. Hillwood has flown the P.1 on more than one occasion—he was, in fact, the second pilot to fly it—his main work is in connection with the Canberra. The chief experimental test pilot under W/C. Roland Beamont (manager of flight operations and chief test pilot) is now S/L. Desmond de Villiers—who, as recorded in *Flight* of March 25th, recently joined English Electric. In future he will share in the P.1 development flying. Roland Beamont has so far done most of the flying in the new fighter.



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First Dutch Hunter

HUNTER production is now going forward in three countries: Great Britain, Holland and Belgium. While large-scale deliveries of Hawker-built machines are being made to the R.A.F., the first aircraft of a sizeable combined NATO and Dutch Government order has now made its first flight from Schiphol. Altogether, NATO orders call for 112 Hunters to be built by Fokker in Holland and S.A.B.C.A. and Avions Fairey in Belgium, and the Dutch Government has ordered a further 156 Hunters from Fokker. The initial machines are being assembled from parts flown over to the Fokker factory from Britain; later aircraft will be entirely Dutch and Belgian-built.

Fokker's chief test pilot, Gerben Sonderman, made the first flight, and "Jas" Moll, another Fokker test pilot, has now also flown the aircraft. Reports from Holland indicate that Hunters —they will be Mk 4s and 6s—are eagerly awaited by the Dutch Air Force. Some new details are given by *Avia-Vliegwereld*. The push-button undercarriage control, for instance, is so positioned that the wheels can be raised after take-off by "pointing" the left forefinger with the hand still on the throttle. The flap control is a short lever (a completely different shape from that of the undercarriage control) which permits fine adjustment of flap setting. A number of hydraulic and fuel pressure warning indicators are of the "doll's-eye" type. Two V.H.F. sets are fitted.

Three cartridges are provided for engine starting and can rapidly be replaced. Take-off is reported to require between 10 and 15 sec and undercarriage retraction 6 sec. Climbing speed is quoted as 0.87 Mach, with a cruising speed in the region of 0.92 Mach. Fully powered aileron control allows a rate of roll in the region of 300 deg/sec, which is close to the human tolerance for such a manœuvre. The elevators are servo-assisted and there is, therefore, a feedback of aerodynamic loads, but the effect can be alleviated by making use of an electric stick-top trimmer. Maximum speed for undercarriage extension is 230 kt and approach speed is quoted as 20 per cent higher that that of the Meteor.

Test pilot Sonderman. A photograph of the Hunter is on p. 605.

The Wilbur Wright Lecture—and R.Ae.S. Awards

"FLIGHT CONTROL" in theory and practice will form the subject of the Royal Aeronautical Society's 43rd Wilbur Wright Memorial Lecture, to be given on May 19th by Dr. C. S. Draper, F.I.A.S., head of the Department of Aeronautical Engineering at the Massachusetts Institute of Technology.

Dr. Draper has written extensively in the fields of instrumentation and control, and is a well-known consulting engineer.

Since 1922 Dr. Draper has been continuously at M.I.T., becoming Professor of Aeronautical Engineering in 1939 and head of the department in 1951. In 1946 he received the Medal for Merit and the Naval Ordnance Development Award for his war-time work in anti-aircraft fire control, and among his other distinguished awards are the Sylvanus Albert Reed Award of the Institute of the Aeronautical Sciences and the Exceptional Civilian Service Award made by the Department of the Air Force.

As is customary on the occasion of the Wilbur Wright Lecture, the Royal Aeronautical Society's awards will be presented. The R.Ae.S. Gold Medal—the highest honour which the Society can confer in recognition of scientific achievement in aeronautics—is being awarded to Lord Hives (chairman and joint managing director of Rolls-Royce, Ltd.) "for his outstanding work in the field of aircraft propulsion."

Recipients of other medals awarded will be as follows:—

The Society's Silver Medal (for work of an outstanding nature in aeronautics).—Dr. R. A. Frazer, for his outstanding work in aerodynamics over a period of many years; and Dr. A. A. Griffith, for his outstanding research contributions on aircraft engine design. **The Society's Bronze Medal** (for work leading to an advance in aeronautics).—Professor M. J. Lighthill, for his contributions to aeronautical knowledge. **The Wakefield Gold Medal** (for the designer or inventor of any apparatus tending towards safety in flying).—Mr. J. Taylor, for the design and development of the counting accelerometer. **British Gold Medal** (for outstanding practical achievement leading to advancement in aeronautics).—Mr. G. H. Dowty, for his outstanding practical achievement in the design and development of aircraft accessory systems. **British Silver Medal** (for practical achievement leading to advancement in aeronautics).—Dr. S. G. Hooker, for his practical achievement in the design and development on aero engines. **George Taylor (of Australia) Gold Medal** (for the most valuable R.Ae.S. paper on aircraft design, manufacture or operation).—Mr. R. C. Morgan, for his paper on *Practical Experience of Airline Engineering*. **Simms Gold Medal** (for the most valuable R.Ae.S. paper on any subject allied to aeronautics).—Dr. D. Williams, for his paper on *Recent Developments in the Structural Approach to Aeroelastic Problems*.

As recorded in *Flight* last week, Honorary Fellowships have been awarded to Mr. Igor Sikorsky and Mr. H. Grinsted. On the occasion of the presentation, at the Society's annual general meeting on May 5th, the following awards were also made:—

R. P. Alston Memorial Prize (for practical achievement associated with the flight-testing of aircraft).—G. A. V. Tyson, for his contributions to the flight testing of marine aircraft. **Edward Busk Memorial Prize** (for the most valuable R.Ae.S. paper on applied aerodynamics).—J. C. Wimpenny, for his paper on *Stability and Control in Aircraft Design*. **Herbert Akroyd Stuart Memorial Prize** (for the most valuable contribution on applied thermodynamics).—E. E. Chatterton, for his paper on *Compound Diesel Engines for Aircraft*. **Usborne Memorial Prize** (for the best contribution by a graduate or student on some subject of a technical nature in connection with aeronautics).—L. F. Crabtree, for his paper on *The Compressible Laminar Boundary Layer on a Yawed Infinite Wing*. **Orville Wright Prize** (for the best contributions to the *Aeronautical Quarterly* of the Society).—D. B. Spalding and B. S. Tall, for their paper on *Flame Stabilization in High Velocity Gas Streams and the Effect of Heat Losses at Low Pressures*. **J. E. Hodgson Prize** (for the best paper of a general nature, with emphasis on historical work).—Maj. G. P. Bulman for the First Barnwell Memorial Lecture; and J. Smith, for the First Mitchell Memorial Lecture.

Royal Aeronautical Society Navigation Prize (for the best paper on navigation, including meteorological instruments and test equipment).—J. F. W. Mercer, for his paper on *A Quantitative Study of Instrument Approach*. **R.38 Memorial Fund.** Two awards from the R.38 Memorial Fund were made, to Lord Ventry (to assist him in his experiments and to help in the development of the airship *Bournemouth*), and to Mr. W. N. Alcock (to assist him in further investigations in connection with airships).

Finally, the Society has announced the election of twenty-two Fellows, whose names we hope to list in a forthcoming issue.

Below (left to right), Sir Sydney Camm, the retiring president, presents Honorary Fellowships to Mr. Sikorsky and Mr. Grinsted, the R. P. Alston Memorial Prize to Mr. Tyson, and R.38 Memorial Fund awards to Lord Ventry and Mr. Alcock. On the right, Mr. E. J. Mann (right), secretary of the Hatfield Branch, presents a silver salver to Mr. N. E. Rowe, the new president, as a token of appreciation of his previous work, as chairman of the branches committee, for the 25 R.Ae.S. branches.

"Flight" photographs

HERE AND THERE

U.S.A.F. Mission to Australia

FOUR U.S.A.F. jet fighters and four big transports are due to arrive in Australia next Wednesday, May 18th, on a goodwill mission. The Australian Minister for Air, Mr. Townley, has said that the visit will be the second of a series of U.S.A.F. long-range training flights to Australia; the first was made a year ago. All the aircraft will fly non-stop from Japan to Australia, and the Thunderjets will be flight-refuelled over Guam and Manus Islands.

Honour for S.M.A.E.

THE DUKE OF EDINBURGH has consented to become patron of the Society of Model Aeronautical Engineers, the body which, under the sanction of the Royal Aero Club, controls model flying in the United Kingdom. The Society recalls that when His Royal Highness visited the Model Engineer Exhibition in 1952 he displayed particular interest in the S.M.A.E. exhibit. The organization now embraces over 400 clubs and thousands of individual members.

Yeadon at Whitsun

LEO VALENTIN, the French parachutist who, using a pair of wings, makes "gliding" delayed drops, will be among the attractions at the S.S.A.F.A. air display at Yeadon, Leeds, on Whit-Monday, May 30th. It will be his first appearance in this country. Other events—interspersed with the classes in the second round of the National Air Races—will include demonstrations by Meteors of No. 609 Sqn., a Hunter, a Canberra and a Provost; it is hoped that a Sipa Minijet will come over from France; Gerard Smith will give a sailplane demonstration; and "Dumbo" Willans will make a delayed drop.

LAURELS AND GILT: Marching past in Moscow's Red Square on May Day are officers from Russia's Zhukov Engineering Academy. Their uniforms are said to be more ornate than any hitherto seen on a Soviet officer. The tunic is light blue with epaulettes; the belt and ornamental cap are gold-braided; the collars and cuffs are embroidered with gold laurel leaves; a gold-and-white striped belt carries a buckle, bearing a five-pointed golden star; and from the belt there hangs a short gilt-scabbarded sword.

S.A.C. on the Screen

DAILY work at Carswell and MacDill A.F.B.s, with flying in B-36s, B-47s, KC-97s, T-33s, H-19s and other aircraft, is featured in a new Paramount picture, *Strategic Air Command*. It opens at the Plaza, London, on June 17th.

Manpower for Production

EMPLOYMENT in the British aircraft industry continues to rise at a rate of about 2,000 a month. January figures, recently issued, showed a total of 240,900—an increase of 1,900 on the previous month and of 11,700 since January 1954. The figures relate only to men and women employed on airframes, engines, airscrews and undercarriages; they do not include other component or sub-contract work.

Trans-Alpine Soaring

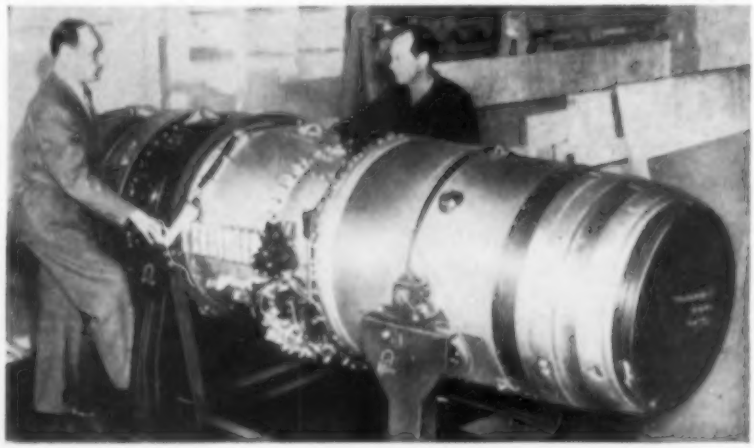
REFERRING to the French claim—quoted in our April 22nd issue—that the sailplane flight by René Branciart on April 14th was the first-ever glider flight over the Alps, a correspondent points out that this is fallacious. Five such flights were made from Salzburg on May 30th, 1937, he recalls, and a sixth on the following day.

In the Picture

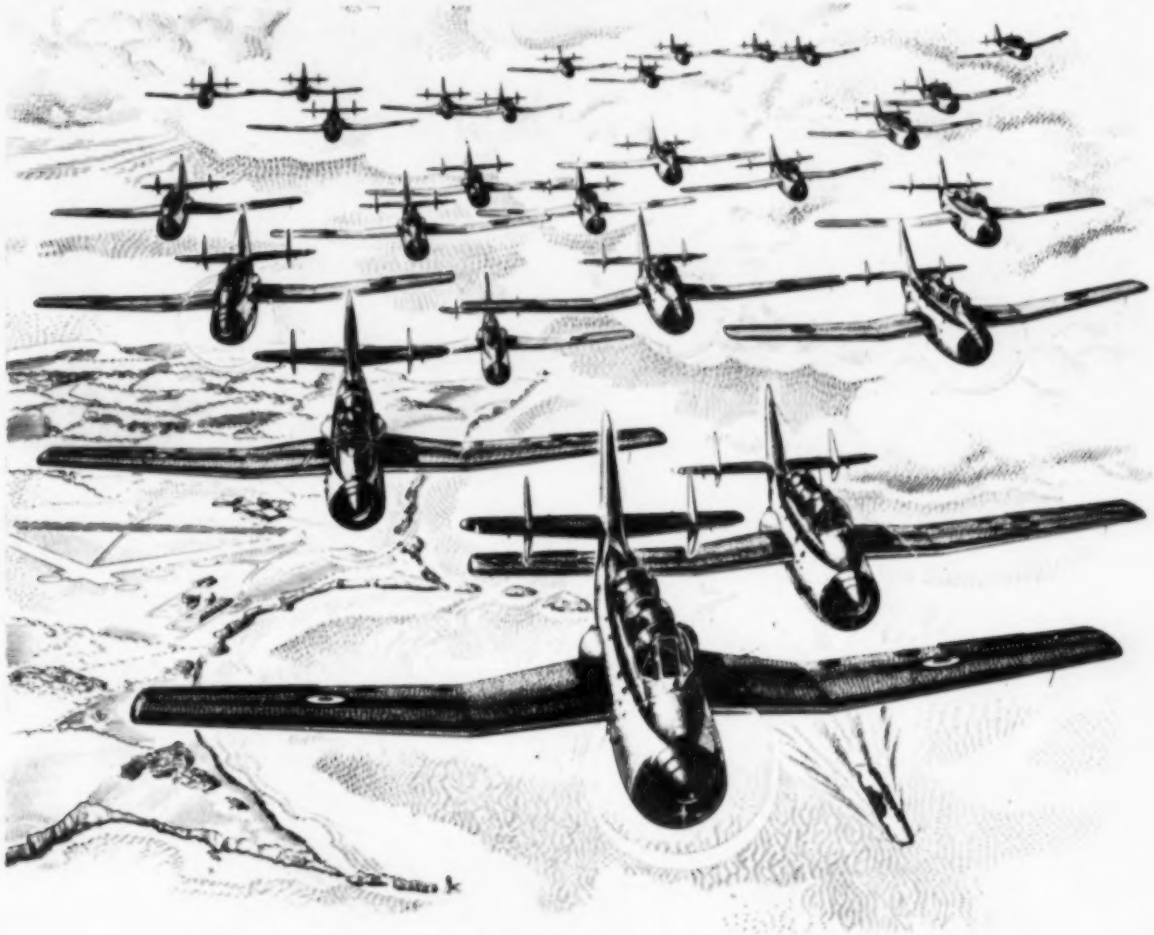
IN connection with the first British Photo Fair (New Horticultural Hall, London, May 16-21), *Amateur Photographer* is publishing a special number next Wednesday, May 18th. Contents will include a complete survey of the exhibits, and details will be given of a free-entry photographic competition in which some £250 in prize money is being offered.

FASHIONABLE ACCESSORIES for the helicopter-about-town are floats and a silencer: the second of B.E.A.'s WS-55s, to be used on the London Airport - South Bank service, being tested at Yeovil by Westland pilot John Fay.

DERBY TO SAN DIEGO: This Rolls-Royce turbojet is shown being received by Clyde Cordner, Ryan chief of test facilities, and Robert Lankard, supervisor of engineering shop. The engine—obviously a late-model Avon—was chosen by Ryan to power the XF-109 vertical take-off prototype, owing to its good thrust/weight ratio. This engine is believed to be the first Avon exported to the U.S.A., and the XF-109 is certainly the world's first true V.T.O. jet-fighter.



No doubt about the GANNET



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MORE THOUGHTS on JET LIFT

Getting Down To Economics

WHEN we published "Jet Lift" in our issue of February 4th of this year we expected it to arouse more than usual interest. In the event, some readers even considered such developments as those envisaged by Rolls-Royce, Ltd., so advanced as to be impracticable—at the present time, at least. This contribution, from "Quidnunc"—a reader who wishes to remain anonymous—is neither wholly "for" nor "against," but suggests a number of intermediate possibilities.

IN a recent issue of *Flight* a description was published of a "jet-lift" aircraft of 300,000 lb all-up weight, with a wing loading of 300 lb per square foot, a thrust loading of 2.5 lb per lb, and provision for a maximum jet lift of 500,000 lb. Criticisms could be—and in fact were—levelled against this design; but my purpose here is not to attack or justify it, but to use it as a basis for a discussion of various possibilities in the application of jet lift to aircraft in general.

The fundamental problem in any such design is to achieve acceptable take-off and landing performance at the minimum cost in terms of lift engines and fuel. In this particular case, take-off and landing were both vertical—the best possible performance; but it remains to be seen whether the achievement of this ideal was worth the cost. The total weight of the 50 lift engines amounted to 50,000 lb. The author gave no figures for pay-load, but whatever it might have been, it is evident that we could make a substantial addition to it if we were able to dispense with some at least of the lift engines. There is also the question of the amount of fuel to be carried for lifting purposes; let us see how much this would be for the original specification.

During the V.T.O., all lift engines would be running, with a fuel consumption of slightly more than 200 lb per second; if we allow no more than five seconds for this, it will still entail the use of 1,000 lb of lift fuel. From this point the aircraft accelerates horizontally under the power of the main engines until it reaches the minimum safe wing-borne speed, which could hardly be less than about 240 knots; at the beginning of what we may conveniently call the "take-off run" 20 of the lift engines would be closed down, so that the jet lift just balanced the a.u.w., and the remainder would be cut out in succession, as the lift of the wing built up to a point where it was capable of supporting the whole weight. As the lift of the wing varies as the square of the air speed this cutting-out process would not be uniform but would begin slowly and speed up towards the end of the run; thus the mean lift taken from the jets would not be half the maximum lift but about two-thirds, i.e., 200,000 lb. The take-off run would occupy about 35 seconds, and the lift fuel consumed would come to about 3,000 lb, giving a total consumption for the take-off of 4,000 lb. For landing the process would be reversed, but the "landing-run" would be considerably longer than the take-off run, since the aircraft's drag would be the only retarding force; even if we allow 50 per cent reverse thrust from the main engines it is doubtful if we could bring the aircraft to rest in less than 60 seconds. If we take the landing weight as, say, 230,000 lb, the fuel consumed in the landing run would amount to about 3,800 lb. The actual let-down might occupy about 15 seconds, during which time a further 1,400 lb would be burnt. Thus the total consumption of lift fuel per flight would be not less than 9,000 lb, to which must be added at least another 9,000 lb reserve for emergencies. The weight of the whole jet-lift installation, then, is about 68,000 lb—say 70,000 lb including the weight of fuel tanks, etc.

This means that if we removed the whole installation, and relied upon a catapult, perhaps, or a pick-a-back aircraft to get the machine into the air, and parachutes to effect a safe landing, we could increase the pay-load by 70,000 lb (less the weight of the parachutes). The desirability of reducing the weight of lift jets and fuel to the absolute minimum hardly needs stressing therefore.

An aircraft of this type could not conceivably be operated in (or within some miles of) a city or built-up area; hence V.T.O. is an unnecessary luxury. Let us throw out 20 of the 50 lift engines, thus saving 20,000 lb in tare weight (beside a large proportion of the first cost and maintenance costs) and see if we can make do with only 30.

With 30 lift jets in operation the aircraft will not leave the ground, but its effective weight will be reduced to nothing. If we stand it on the brow of a cliff, facing out to sea, it will move over the edge as soon as the main engines are opened up; but it will not fall into the sea. Having no weight, it will continue to accelerate in a horizontal path throughout the take-off run. In this way we can save the whole of the lift fuel burnt in the V.T.O., which with 100 per cent reserve amounts to 2,000 lb. The landing case is slightly altered, too, As there is now no question of making a spot landing in a restricted space and the surroundings of the landing area are open country we can safely make the landing run at a much lower height than before, with a correspondingly quicker let-down. We might well save 1,000 lb (2,000 with reserve) here also.

Of course, the aircraft would not in practice be restricted to the tops of cliffs for its operation; any small plot of ground above the level of its surroundings would do. But we must be on our guard against the temptation to try to climb during the take-off run. As soon as the nose is raised, the lift thrust and the weight will combine to give a resultant force opposed to the thrust of the main engines, thus prolonging the take-off. A climb of 5 degrees would increase the time—and the fuel burnt—by 33 per cent; 22 degrees would bring the aircraft to a standstill. It is fatal to try to fly with the jet lift inclined backwards.

If the restriction of the aircraft to raised ground for its take-off were not acceptable, we could very easily get over the difficulty. We have only to tilt the thrust-line of the lift engines, say, 5 degrees forwards from the vertical and give the aircraft a ground-angle of 5 degrees, and it will take off and climb away at this angle as soon as the engines are opened up. Being weightless it will accelerate just as rapidly as before; the only penalty for a climbing take-off run will be an increase in the lift fuel burnt proportionally to $1-\cos\theta$, where θ is the angle of climb. A 5-degree climb would clear a 50-foot screen in less than 200 yards, and would add 60 lb to the all-up weight. Fifteen degrees would entail a weight increase of 200 lb. Even a vertical climb could be achieved at a cost of no more than doubling the fuel burnt in a normal take-off, or an addition to the all-up weight of 6,000 lb; and as our modifications have saved 24,000 lb so far, we are still 18,000 lb better off than the original design.

The question now arises, Supposing circumstances compelled us to adopt a fairly steep angle of take-off, could we save some of the weight penalty by levelling off after we had passed the obstacle in our way? We could. If we fit our lift engines with jet deflectors adjustable in flight we can level off at any stage of the take-off run; we can in fact vary our angle of climb as we will so long as we ensure that the jet lift is never directed backwards. If three-quarters of the run is performed horizontally, we shall only incur one-quarter of whatever penalty is appropriate to our initial angle of climb. It is interesting to apply this to the V.T.O. case. The original design envisaged a vertical lift to no more than 300 feet. Our modified design would reach this height in about seven seconds, or one-fifth of the take-off time, so that if we levelled off at this height, thus following the flight-path originally specified, we should incur a penalty of only 1,200 lb. That is to say, we can perform exactly as specified, while carrying a pay-load 22,800 lb greater than before. Alternatively, we can carry a pay-load 18,000 lb greater than specified and take it vertically up to about 7,000 feet. As, however, there is no practical advantage in either alternative we need not pursue the point.

The fitting of jet deflectors would allow another interesting possibility which is worth considering, however. Suppose that instead of cutting out the lift engines progressively along the take-off run we keep them all running but deflect them further and further forwards as the lift requirement falls off, relying upon the vertical component of their thrust to keep us in equilibrium, while using the horizontal component to increase our acceleration along the flight path. What effect would this have on our fuel consumption?

The lift thrust will remain constant throughout the take-off, at a figure of 300,000 lb, entailing a fuel consumption of 125 lb per second. But the acceleration, beginning at 0.4g, would rise, rapidly at first and then more slowly, to a maximum of 1.4g, and the time would be cut down to less than 15 seconds. The total take-off consumption would be no more than 2,000 lb, thus effecting yet another saving of 2,000 lb in our all-up weight. The effect in the landing case would be even more marked. At a landing weight of 230,000 lb initial retardation would be about

MORE THOUGHTS ON JET LIFT . . .

1.6g. Six of the jets, not required for support, could be kept fully deflected throughout the landing run, so that, with fifty per cent reverse thrust from the main engines, the retardation would not fall below 0.52g at the end of the run, giving a mean figure of about 1.3g. The aircraft could be brought to rest in little more than 10 seconds, burning 1,250 lb of lift fuel in the process; a 5-second let-down at 230,000 lb weight would consume another 500 lb, giving a total of 1,750 lb, representing a further saving of 4,500 lb.

This seems to be about the best we can do while still retaining the ability to take off and land without any ground run. We have incurred the additional weight of jet deflectors fitted to 30 of the lift engines; but we have dispensed with the other 20 altogether and have reduced our gross lift fuel requirement from 18,000 lb to 7,500 lb, thus increasing the payload by, in round figures, 30,000 lb.

There is a further case yet to be considered. Suppose we take out another six of the lift engines, retaining just enough to allow us to land vertically. Then at take-off the aircraft will have an effective weight of 60,000 lb even with all jets running. It will have to make a normal take-off from a runway, and with a wing-loading equivalent to 60 lb per square foot it will run 1,500 feet before unsticking. It obviously would not pay to run the jets at all while still on the ground; they would be opened up, vertically, when the wing lift had risen to 60,000 lb, and thereafter the take-off would continue as before, except that with only 24 instead of 30 jets available the acceleration would be less; the air-borne part of the take-off run would occupy about nine seconds, and the fuel consumed would be about 1,000 lb. In the landing case, the reduced lift thrust available would mean a longer landing run of about 15 seconds, and the total lift fuel consumed would be about 2,000 lb—slightly more than before. The net saving in lift fuel would only be about 1,500 lb, to which must of course be added the weight—6,000 lb—of the engines taken out. But it is at least questionable whether this saving would be enough to compensate for the extra weight which would have to be built into the undercarriage to permit of a runway take-off; and when one takes into consideration that we have lost the very valuable ability to take off from any surface without ground run, I think it will be agreed that this is not worth while.

I should like to emphasize that none of the figures I have given has any pretence to exactitude. In arriving at them I have simplified problems, straightened curves and cut corners generally; but unless I have been guilty of some egregious howler I hope that they may be taken as reasonable approximations. If they are, we should be able to draw certain conclusions from them, as follows:—

(a) The amount of jet lift to be provided need never exceed the maximum all-up weight of the aircraft.

(b) With jet lift equal to the max. a.u.w., an aircraft could leave the ground with no run, and if fitted with jet deflectors could climb away at any initial angle; but steep angles of climb would entail an appreciable weight penalty and should never be prolonged further than necessary. The penalty for angles of 15 degrees or less would be negligible.

(c) Vertical take-off on an even keel would be both expensive and unnecessary.

(d) An appreciable saving could be effected by compensating for varying wing lift during the take-off and landing runs by deflecting all lift jets instead of varying the total lift—but at the expense of considerable accelerational discomfort to passengers.

(e) When used in the most economical way, the lift engines would not require an exorbitant provision of fuel—not more than 2-3 per cent of the a.u.w.

(f) No practical advantage would be obtained by providing jet lift equal to *less* than the a.u.w.

The results of our various modifications are summarized in the following table.

	Take-off	Effective climb angle	Jet lift lb	Lift fuel lb	Payload lb
Original design ...	Vertical	2° 20'*	500,000	18,000	w
"Mk II" ... ... (lift = a.u.w.)	No run	5°	300,000	14,000	w + 24,000
"Mk IIA" ... (deflectors)	No run	Any angle	300,000	7,500	w + 30,000
"Mk III" ... ... (reduced lift)	Runway 1,500ft	Any angle after unstick	240,000	6,000	w + 37,500

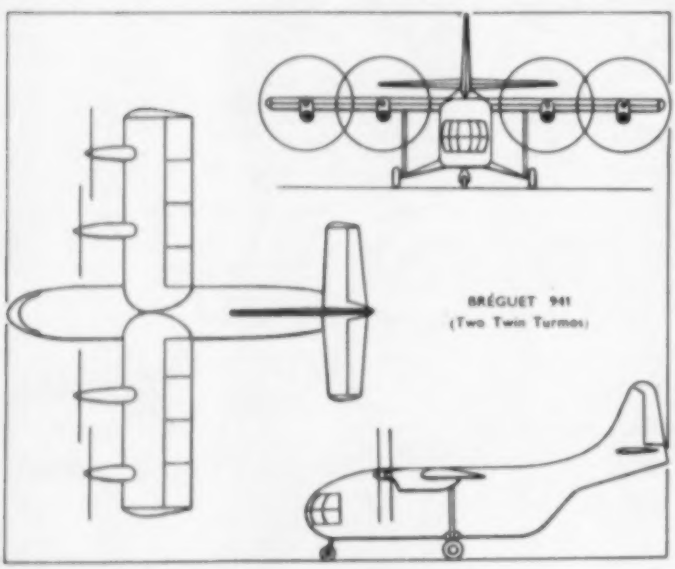
* 300ft vertically, followed by 7,500ft horizontally.

BRÉGUET PROJECTS

A Military Version of the Integral, and an Anti-submarine Vultur

COINCIDENT with the news of the death of Louis Bréguet (see page 606), reports have appeared of yet another of his famous company's projects. This latest, a military version of the Bréguet 940 Integral, has been given the type designation Br.941.

The layout and principles of the civil-transport Integral were outlined in *Flight* of February 25th. Broadly speaking, the object is to produce a fixed-wing aircraft which could utilize a helicopter's landing-ground and yet be less vulnerable to engine failure on take-off. The type 940 has a high unbraced wing with a span of 52ft fitted with double flaps and mounting four 13ft airscrews driven by four Turboméca Turmo turboprops mounted in the two inboard nacelles. All four airscrews are linked by a transverse shaft so that engine failure will not stop any one airscrew. The outboard airscrews can be used by the pilot for directional control. A further small turbojet in the tail is deviated to give additional directional control at very low speeds.



The type 941, of which a three-view drawing is shown here, is a military assault-transport version of this project. The fuselage differs mainly in having provision for a large rear-loading door under the tail. The four Turmos will be disposed in four separate nacelles and will each drive one 13ft airscrew. (In the Type 940 the same power is obtained from two twin Turmos in the inner nacelles.) The Turbomeca Marbore II in the tail is eliminated. The main landing wheels are no longer on outriggers, but are carried on plain compression struts.

Models of the 941 will be on view on the Bréguet stand during the Paris Show in June. The aircraft is intended to take off in 64yd and to carry a 6,600-lb load for 620 miles.

Another Bréguet project, the single-engined anti-submarine version of the Br.965 Vultur, has now flown. The first aircraft is in fact the second Vultur prototype considerably rebuilt to house in the after fuselage a retractable "dustbin" radar scanner instead of the Nene, and two large pinion containers (for either weapons or detection gear) just ahead of the main undercarriage legs. The ample cockpit canopy now contains only one segment of transparencies. The modified Vultur is a precursor of the first prototype Br.1050s which are due to fly in the early summer of next year. There will be five of them.

Two types of engines are reported by a French source to be under consideration—either Armstrong Siddeley Mambo 6 of 1,650 h.p. or the Rolls Royce Dart RDa.7 of 1,950 h.p. The aircraft will be armed with a full range of detection gear, now being tested in the modified Vultur, and with rockets and depth charges. Loaded weight will be 17,900 lb, maximum speed 270 m.p.h., and ceiling 19,200 ft.

ROUTINE CROSSING

Passenger's Impressions of a Typical Transatlantic Flight by B.O.A.C. Stratocruiser

R.M.A. "Caledonia"

IF you fly B.O.A.C. Monarch from New York to London, as I did one day in late March, your journey will probably begin at the East Side Airlines Terminal just before 3.30 in the afternoon. The flight was due out at 5 p.m., and the ticket (£142 18s single) offered a choice of two reporting times: 3.30 at the terminal or 4 p.m. at New York International Airport.

The bus from the East Side Terminal proved as quick and inexpensive a way as any of reaching the airport on time. Coach services are operated for the airlines by the private firm of Carey Transportation, whose streamlined *Airporters*, cruising at up to 60 m.p.h., cover the 15 miles or so to Idlewild in half an hour.

Airline buses between London Airport and the Victoria or Waterloo terminals take at least twice as long to cover a similar distance. The use of modern express highways and the near-absence of traffic lights (if I remember rightly there are only four sets between East Side and Idlewild) make the New York journey much less tedious and, by American standards, a fair return for a single fare of $1 35c (9s 8d). Incidentally, the Carey coaches are still colloquially referred to as "limousines"—a reminder that not so many years ago one large car could convey a plane-load of passengers.

Idlewild is at present using temporary terminal buildings, though the Port of New York Authority have announced plans (*Flight*, April 22nd) for a permanent central terminal of gigantic proportions. The existing set-up, from a passenger's viewpoint, could be likened to a larger version of L.A.P. North with a better supply of eating and drinking facilities, shops and "vending" machines. Features which I had not seen previously were the flight weather forecasts displayed on some airline counters and, in other cases, the inclusion of captains' names on the indicator boards listing arrivals and departures.

With 49 fellow-passengers for London, I reported at the B.O.A.C. counter for checking of tickets, weighing of luggage and labelling of hand-baggage. Each of us also received a boarding-card showing the position of the seats allocated to us; printed on the reverse side was an "occupied" sign, for reserving one's seat at transit stops. Perhaps a few words should have been said at this point about embarkation procedures. Looking back, however, I realize that I somehow missed this part of the departure process; to the best of my recollection I simply bade farewell to my friends and walked out of the terminal on to the aircraft. But no doubt there are Customs, emigration and tax men at Idlewild, and I apologize for unwittingly slipping through the screen.

The aircraft assigned to operate Flight BA510 on this particular day was G-AKGH *Caledonia*, flagship of B.O.A.C.'s fleet of 16 Stratocruisers. Well kept inside and out, it bore few signs of the 650 North Atlantic crossings recorded in its log book since it was delivered to B.O.A.C. more than five years previously. A passenger on its very first crossing—the delivery flight from Seattle to London—was the Editor of *Flight*, who described the journey in a series of articles in December 1949.

"Monarch" Stratocruisers can accommodate 60 passengers in their two compartments—one forward and one aft of the amidships galley; sleeping berths, of which up to 16 are available at a surcharge of $50 (17 guineas), fold down from the walls of the forward cabin, and are enclosed by curtains during the night. Competition for first-class traffic is keener on the North Atlantic than on any other international route, and any shortcomings in cabin comfort are soon reflected in the bookings situation. Consequently the maximum seating capacity of the Stratocruiser is not normally sold; 50 passengers represent a full complement.

Past experience should have taught me what to expect, but I was half-disappointed to find that my fellow travellers on this Blue Riband flight were not as depicted in the glossy magazine ads. for air travel—sophisticated, swan-necked ladies in Dior gowns, with tweedy, prematurely grey escorts drawn from the best regiments, clubs and boards of directors. True, there was a genuine duke aboard, but I didn't discover the fact until, waiting in the immigration room at London Airport, my glance fell upon a copy of the passenger manifest. Perhaps the characters in the advertisements don't really exist; or, if they do, they probably travel only in twos and threes and not in whole aeroplanes-full.

The Monarch service is scheduled to fly direct from New York to London, leaving at 5 p.m. and arriving at 9.45 a.m. the next morning (local time in each case). A call is made at Boston (listed in the timetable as a "flagstop") if any passengers require to be picked up there. And if tailwinds are poor or non-existent, or if the payload is high, a refuelling stop is included in the flight plan. Gander is preferred for this purpose, because B.O.A.C. have their own operations staff there. Failing Gander, the "technical stop" (to quote the timetable once more) is made at Goose Bay or Sydney, Nova Scotia.

In our case, the flight plan was drawn up on the basis of both low tailwind component and a high payload (50 passengers plus full freight compartments). When all the passengers were aboard the stewardess made a little speech announcing that, *inter alia*, we would be calling in at Sydney, Nova Scotia, that our flight time would be 2 hr 28 min, and that dinner would be served *en route*. Next, the stewards gave their demonstration of life-jackets, which are stowed beneath the seats. The accompanying commentary, beginning with the customary "As aboard a ship at sea . . ." dealt with the position of emergency exits, as well as the method of donning life-jackets. It was delivered over the public address system by the steward in the forward cabin, so that his colleague was required only to perform a kind of charade for the benefit of the passengers in the rear cabin. Finally, a distribution of newspapers, magazines and barley sugar.

Our Stratocruiser taxied out to the runway with a characteristic thin stream of exhaust smoke flowing from each of its four quietly turning Wasp Majors. The runway was much in demand, both for landings and for aircraft which had left the ramp ahead of us, so it was not before 5.30 that our wheels left the runway—with a good proportion of its 9,000ft expanse unused. *Caledonia*'s farewell to New York was almost immediate, for we turned north-east to follow an off-shore airway to Sydney. In gathering dusk we identified Nantucket Island and Cape Cod from our route maps and that was the last glimpse of the United States. But by this time no one was interested in scenery, since the Stratocruiser's roomy interior was fast being transformed into an airborne restaurant. The meal, all seven courses of it, was fully in keeping with B.O.A.C.'s reputation, and so too was the service.

One American passenger was pleased to see that the cabin attendants changed into white starched coats before serving dinner. Another drew attention to the silver serving trolley which they rolled down the aisle of the cabin—certainly an unusual sight in an aircraft but a brave gesture which, one hopes, has succeeded despite all the inevitable protests from wielders of slide-rules and calculators of costs-per-ton-mile. All of us, I think, were impressed by the cabin attendants' thoroughly professional manner—their ability to make the passengers feel well-cared-for and important, and to do so without confusing service and servility.

It was dark by the time we reached Sydney (one minute behind flight time), where the passengers spent an hour in the airport waiting room while *Caledonia* was refuelled. After take-off I advanced my watch by five hours to prepare for the transition from New York to London time. Incidentally, flying the Atlantic provides a useful opportunity of sorting out any mental confusion one may have over time zones; some people have to perform mental acrobatics to grasp the significance of date-lines and of clocks being put forward or back (I know; I am one of them). The Atlantic route, at least, is simple enough: flying east, from America to Europe, you are approaching the rising sun, so the night is shorter by five hours, and *vice versa*.

However, re-setting my watch from 9 p.m. (Thursday) to 2 a.m. (Friday) did not produce an instant desire for sleep, so this was the logical time to meet some fellow-passengers over a drink in the bar. Freedom to walk up and down stairs between the bar and the cabin is, of course, one of the great selling points of the Stratocruiser. B.O.A.C. are wise to retain it in their 83-seat tourist versions, now operating to Montreal and soon to serve New York. Situated on the lower deck immediately behind the trailing edge of the wing, the bar is trimmed in grey and yellow leather and has a large mirror as the forward wall to give an illusion of greater spaciousness. As it is, it will accommodate at least a dozen people in reasonable comfort, though it has no doubt attracted larger crowds on occasions.

Here I encountered a cross-section of the wide variety of people who make use of North Atlantic air services, with no common denominator other than the objective of crossing the ocean. The towering major in Canadian Army uniform ("call me Tiny")

(*Continued on page* 613)

CIVIL AVIATION

ATLANTIC FAMILY FARES

TO encourage travel during the off-season, I.A.T.A. airlines will offer substantial discounts to family parties flying on North and Middle Atlantic routes between November 1st, 1955, and April 1st, 1956. The head of each party—husband, wife or any son and daughter between the ages of 12-25—will pay the full off-season fare. Other members will benefit from the following discounts: first-class return, £117 8s; first-class single, £53 12s; tourist return, £85 15s; tourist single, £46 9s. Children under 12, who already pay only half the full fare, will not be eligible for "family-plan" reductions. To benefit from the plan, members of families will normally be required to travel together. Unlike the family discounts offered on American domestic routes, the new Atlantic rates will be valid every day of the week during the off-season.

LUFTHANSA'S INTERNATIONAL DEBUT

ON May 16th Deutsche Lufthansa enter a new phase with the beginning of their regular international operations. Since April 1st the company has operated domestic passenger flights over the routes Hamburg - Dusseldorf - Frankfurt - Munich and Hamburg - Cologne/Bonn - Frankfurt - Munich, but with the introduction of international services these cities will only be served as part of the overall network.

Proving flights with Convair 340s have been made over all routes. The first flight was from Hamburg to London on April 15th, and this was followed by proving flights to Madrid *via* Lyons, Marseilles and Barcelona (April 16th), from Hamburg to Paris (April 19th) and from Munich to London (April 24th). Since then further route-proving and training flights have taken place. All four Convairs are in service and three of the four tip-tanked L.1049G Super Constellations for North Atlantic operations have now been delivered; they are being used on long crew-training flights. Federal Germany's Chancellor, Dr. Adanauer, used a Super Connie for his journey to Paris on May 7th.

The first of five proving flights to New York will leave Hamburg on May 24th and the Hamburg-New York service is due to open on June 8th. This route will at first operate twice weekly; Wednesday flights from Hamburg will call at Dusseldorf, and Saturday flights will stop at Frankfurt. All services will call at Shannon and there will be refuelling stops at Gander when necessary. The frequency of the North Atlantic services will be stepped up progressively until July 5th when there will be flights from Hamburg every day except Mondays. All departures from Hamburg will be at 1800 G.M.T.

The Super Constellation will have accommodation for 20 first-class and 45 tourist-class passengers in summer and 16 first-class and 40 tourist in winter. Endurance of the L.1049G with tip tanks is 18 hr, of which the 1,000 gal carried in the tip tanks provides for 3 hr.

At the start of North Atlantic operations T.W.A. captains will be in command with German pilots flying as first officers. The crews will include Lockheed engineers and Transocean navigators. Most of the German pilots have had four-engined experience on Focke-Wulf Condors, Junkers Ju290s and other types.

B.O.A.C. CHANGES

WITH the recent introduction of summer schedules, important changes in capacity, speed and frequency of service are taking place on B.O.A.C.'s network. On the North Atlantic route, Stratocruisers, which are already operating all first-class services, are beginning to take over tourist services from the Constellations. Modified to carry 81 tourist-class passengers, the double-deck aircraft will begin operating "Coronet" services to New York on May 24th. This flight will be routed *via* Manchester, providing that city with both "Monarch" and "Coronet" services for the first time. On May 4th the Corporation's London-Chicago route was resumed with a once weekly Stratocruiser tourist service. The Chicago flight operates *via* Montreal, which is now served by three weekly Stratocruiser tourist flights; by May 16th this frequency will have increased to four weekly.

An innovation will be the use, from the end of June, of two-class Stratocruisers between Britain and Trinidad; 50 tourist passengers will be carried in the forward compartment and the rear compartment will be reserved for 22 first-class passengers, who will have the use of the lower-deck lounge. First-class Stratocruisers will continue to carry 50 passengers, except on the London-Jamaica route when capacity will be increased to 60.

On Eastern and African routes, Constellations will take over many "Majestic" (first-class) services from Argonauts. Already operating B.O.A.C.'s first-class flights between London and Sydney, these aircraft will also introduce tourist services on the Kangaroo route on a once-weekly frequency. Points to be served by first-class Constellation services include Tokyo, Hong Kong, Johannesburg, Singapore and Karachi. "Majestic" Constellations are equipped to carry 38 passengers on all but the Australian route, on which they operate as 34-seaters.

C.P.A. ARCTIC-ROUTE DETAILS

FARES and schedules for their new trans-Arctic service between Vancouver and Amsterdam have been announced by Canadian Pacific Airlines. From June 3rd, the airline's weekly DC-6B flight will leave Vancouver at 10.30 a.m. local time, arriving at Amsterdam the following day at 2.30 p.m. local time. Local departure and arrival times on the return flight will be 11 p.m. Saturday and 10 a.m. Sunday.

Refuelling stops will be made at Manitoba (eastbound) and Sondre Stromfjord (westbound). C.P.A. claim that with the introduction of this service they will be the only airline in the world to operate regularly over the international date line, the equator and the Arctic.

Depending on the combination of first-class and tourist-class seats to be offered, the aircraft will carry 52-64 passengers. First-class return fares will be: Amsterdam-Vancouver $1,047 (£375); Amsterdam-Sydney *via* Vancouver, $1,557.40 (£555); tourist return tickets for these routes will cost $756 (£270) and $1,250 (£445) respectively.

AIRING AIR TRAFFIC CONTROL

THE first issue of *The Journal of the Guild of Air Traffic Control Officers* contains a most useful selection of varied and practical articles. It includes *Radar Sequencing at London Airport*, by W. C. Woodruff, *Air Traffic Control Recording*, by K. Landers Boon, *The Viscount Pilot and A.T.C.*, by Capt. W. J. Johnson, *The Use of Radar in Air Traffic Control*, by N. R. Norfolk, K. I. Pearson and C. A. M. Kyrke-Smith, and a description of flying operations and A.T.C. facilities in Nigeria, by L. S. Vass, which is the first of a series concerning the colonies and commonwealth.

In the journal's leading article, the two main problems of air traffic control are stated to be (1) that too many organizations operate too many differing A.T.C. systems in the limited airspace over the U.K., and (2) that I.F.R. landing rates are too low to cater for either military requirements or the random offering of arrivals at this country's main civil airports. The second of these problems, which depends on the effectiveness of the radio industry in developing improved electronic equipment, the journal submits, can be solved by co-operation between the industry and A.T.C.O.s.

The Guild, and the editor of its journal, Mr. J. K. Sutcliffe, are to be congratulated on the launching of this promising first issue—the first major public project since the Guild's formation last year. Inquiries concerning the work and objects of the G.A.T.C.O. should be made to the Clerk, Mr. W. C. Woodruff, at the Guild offices, 118 Mount Street, Berkeley Square, London, W.1 (Mayfair 5982).

BREVITIES

REGULAR flying-boat services to the Italian Riviera will be inaugurated by Aquila Airways on June 4th. Throughout the holiday season separate weekly return services will be operated from Southampton to both Santa Margherita and Genoa; return fare to either destination will be £34 4s. A proving flight was made last week-end by Solent *City of Funchal*.

* * *

Formerly director of operations for T.A.A., Captain John Chapman has been appointed assistant general manager of the Australian State airline. He succeeds Mr. J. P. Ryland, whose promotion to general manager was announced recently.

* * *

K.L.M. announce the appointment of Mr. Albert Janssen to the newly-created post of regional station manager for the U.K. and Ireland. Mr. Janssen will also continue with his normal duties as station manager at L.A.P.

* * *

Two new appointments announced by the Lockheed Aircraft Corporation are those of Mr. L. K. Schwartz as director of commercial aircraft sales (all divisions) and of Mr. P. K. Yost, who succeeds Mr. Schwartz as commercial sales director at Lockheed's California Division.

* * *

At the end of their first month of Viscount operations T.C.A. announced that the new aircraft had attracted an average passenger load factor of 87 per cent on the Toronto to New York route, which is flown five times daily in each direction. Corresponding figures for the other routes are Montreal-Toronto, 86 per cent;

CIVIL AVIATION . . .

Toronto-Lakehead, 81 per cent; and Lakehead-Winnipeg, 63 per cent. T.C.A. have ordered 25 Viscounts.

* * *

Eagle Aviation have bought four more Vikings, bringing their total fleet strength to 17 aircraft—13 Vikings, two Dakotas and two Rapides. As in 1954, Eagle have secured the Government contract for operating leave flights to and from Cyprus for Servicemen in the Middle East.

* * *

Lufthansa moved into their new London offices in Empire House, Regent Street, on May 2nd. The German airline emphasizes that this office will serve only as an administrative headquarters; travel agents will continue to be responsible for sales of tickets and tourist information. Telephone number of the new office is Regent 1501.

New Zealand National Airways Corporation earned more than £2½m last year, an increase of some £250,000 over the previous year's revenue. The Corporation's profit was approximately £40,000.

* * *

In charge of the new B.O.A.C. sales office at Winnipeg, Manitoba, will be Mr. A. Wallace Owen, formerly the Corporation's senior sales representative at his home town of Chicago. Mr. Owen, who has been with B.O.A.C. for seven years, served in the R.C.A.F. in the war. This is B.O.A.C.'s fourth sales office in Canada; the others are at Montreal, Toronto and Vancouver.

* * *

Sales resulting from Pan American's "Pay Later" plan since its introduction a year ago now amount to £1,500,000, and the coming year is expected to bring a further £2,500,000 worth of business. The airline, which pioneered the sale of air travel on an instalment basis, reports that it has not experienced a single default in payment.

CLUB AND GLIDING NEWS

AT the annual general meeting of the London Gliding Club at Dunstable on April 30th, an increase in membership to 225 (flying) and 379 (total) was reported. During 1954 a total of 1,882 hours were flown from the site, 1,281 hr of which were in the eleven club sailplanes. The number of launches made was 7,651, and 36 "A", 33 "B" and 34 "C" certificates were gained, together with 11 "Silver C" legs. During the year a Tiger Moth had been purchased, for aero-towing. Mr. Dan Smith, C.F.I., was re-elected chairman at the meeting, and Mr. Godfrey Lee vice-chairman.

EXCELLENT flying weather during April enabled the Yeadon Aero Club to put up a record total of 228 hours. First solos were made by Miss L. A. Hughes, Messrs. J. S. Hoare and J. M. S. Procter, and Cadets J. D. Boyle, P. G. Bamforth and E. B. Hartley; Mr. P. J. Simmonds obtained his P.P.L. During the month one Tiger Moth and one Auster 5 were acquired by the club, bringing the fleet to four Auster J5s, one Auster 5 and two Tiger Moths, with two Rapides available for charter.

ELSTREE Flying Club, also, basked in weather stated to be "almost respectable" during April, to the tune of 353 hours. Whole-hearted participation at the Ramsgate breakfast patrol resulted in the appearance of all seven club machines, plus four privately owned, Elstree-based aircraft. Later the same month, five aircraft ventured to Swansea for the first National Air Race meeting. Future plans include an air display on July 2nd, and a possible tea patrol during June. Mr. E. C. ("Dinty") Moore, an ex-R.A.F. Meteor instructor, has now joined the instructional staff at Elstree.

PEBSHAM Airfield, Hastings, is again open daily to club and private aircraft for the summer season from May to September, from 10 a.m. to dusk (or at other times by prior arrangement). Fuel and oil are available, and a 2s 6d landing fee is charged. Frequent buses connect the airfield with adjacent towns, and use may be made of the airfield transport when available. Pilots visiting Pebsham should keep a lookout for aircraft engaged on pleasure flights from the airfield.

A NEW light-aircraft group, to be known as the Pioneer Flying Club, is being formed by enthusiasts in the Croydon and Farnborough areas. The group hopes initially to have one Taylorcraft, operating from Farnborough during the week and from Croydon at week-ends. Entrance fee, weekly subscription and hourly flying rates are estimated at £2 10s, 5s and 35s respectively. Affiliation to the Popular Flying Association is being sought and, for the future, construction by club-members of an ultra-light machine is planned. Prospective members are asked to contact the secretary, Mr. R. Bailey, at 10 Woodnook Road, Streatham, London, S.W.16.

THE Fauvel AV 36 has now been tested in several countries. The criticisms made here concerning the landing arising from the short "wheelbase" have been echoed in other countries. Another difficulty is that of trimming when the pilot is heavy: as on all tailless aircraft, the permissible C.G. range is small.

In order to reduce the danger from the V tow if one side releases before the other, the apex of the V must include a pulley. There is then no danger of spinning from the release as happened on one occasion in Germany. That the Fauvel is not the simplest of sailplanes to fly is shown by the French ruling of 30 landings or 5 hours in other single seaters before flying the Fauvel.

R.Ae.C. PILOTS' CERTIFICATES, JANUARY-MARCH

No.	Name	Cl.	Date	No.	Name	Cl.	Date
28,648	E. V. Giles	2	11/1/55	28,659	E. B. Paton	2	23/2/55
28,649	J. M. Hughes	3	11/1/55	28,660	E. R. T. Crabb	4	23/2/55
28,650	D. J. McL. M. Gillies	2	11/1/55	28,661	T. C. Hembry	1	23/2/55
				28,662	N. A. L. Thorne	3	24/2/55
28,651	H. E. Hawkins	4	24/1/55	28,663	R. K. White	3	25/2/55
28,652	D. E. Wills	1	24/1/55	28,664	M. O. Bergh	2	28/2/55
28,653	G. D. Jenkins	1	24/1/55	28,665	J. R. Hillman	3	4/3/55
28,654	R. A. Greenshields	4	1/2/55	28,666	C. H. Bennion	3	8/3/55
				28,667	S. J. Thomas	1	23/3/55
28,655	W. G. Fisher	2	1/2/55	28,668	G. Moule	3	31/3/55
28,656	J. M. Jones	4	4/2/55	28,669	R. Myers	3	31/3/55
28,657	D. J. Read	3	7/2/55				
28,658	D. C. G. Edwards	3	11/2/55				

ROUTINE CROSSING (Continued from page 611)

had been recalled to the Militia for a United Nations appointment in Kashmir. A small man in a sports jacket mentioned quietly that he had just flown the Pacific by PanAm Stratocruiser and the United States continent by American DC-7; over the past six months he had sold enough insurance in New Zealand to pay for a six-months' holiday with his family in England ("Africa was a good place to sell insurance but New Zealand is better"). At the bar was a genial, twinkling man with a German accent; he had been a naturalized British subject, we learned, since long before the war, and he owns a toy factory in a London suburb ("I do this trip three or four times a year").

The Monarch bar has no set opening hours. It closes only when the last solitary drinker retires upstairs. Sometimes passengers have remained quietly sipping and chatting to the point of let-down along Airway Green One to London Airport, and this band of determined types is known to include travellers who have paid the sleeper surcharge. Even so, it should not be inferred that Bacchanalian orgies are held nightly in the bellies of B.O.A.C. Stratocruisers, if for no reason other than the law which forbids excessive drinking aboard aircraft.

On this particular flight the bar was deserted at a relatively early hour and, with cabin lights dimmed to a ghostly blue, passengers were soon comfortably outstretched in their private berths or, blanket-swathed, sprawled in reclining chairs.

Caledonia droned on through the night at a comfortable 270 m.p.h., her engines at half-power cruising setting. At her cruising height of 19,000ft, the air was clear and calm, giving passengers every chance of sleeping through what remained of this short night.

Dawn brought a bright light into the cabin, a view of seemingly glassy ocean and so many early risers that the captain had to make more than one sortie from the flight deck before finding a place at the shaving mirror. Monarch breakfast was followed by sight of the southern tip of Eire, and a final (soft) drink downstairs before the descent through cloud to London. The stop at Sydney, plus a 20-minute wait over the holding-point at Epsom, had put us behind schedule, and we touched down at 11 a.m. My calculations showed that *Caledonia* had covered the first stage of the flight, from New York to Sydney (790 miles) at 328 m.p.h., and the second leg, Sydney to London (2,732 miles) at 255 m.p.h. Her payload was a good one—five tons of passengers and baggage plus nearly four tons of freight.

In conclusion, a word of thanks to the B.O.A.C. crew who, just as the advertisement promised, "took good care of us" on this particular BA510: Capt. A. T. Hughes, 1st/Off. R. Batchelor, Nav/O. E. Graham, Rad/O. T. Pattison, Eng/O. R. Smith, Eng/O. J. Travers, Stewards Martin-King, Butcher and Lewis and Stewardess Gordon.

R. J. B.

Officers of 2nd A.T.A.F., and visitors, watch a Hunter aerobatic display by F/L. T. J. McElhaw at Jever, with No. 98 Squadron's other newly arrived Hunters in the background. On the left are G/C. T. O. Prickett, O.C. Jever; Air Marshal Sir Harry Broadhurst, C.-in-C. 2nd T.A.F.; S/L. J. H. Smith-Carrington, O.C. No. 98 Squadron; and Gen. Raffaelli, Chief of the Italian Air Staff. Under the fin flash of the nearest Hunter is A.V-M. D. G. Morris, S.A.S.O. 2nd T.A.F.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

R.A.F. Appointments

FIVE important appointments have been announced by the Air Ministry. On the retirement of Air Marshal Sir Victor E. Groom in September, Air Vice-Marshal G. R. Beamish, C.B., C.B.E., will become A.O.C.-in-C. Technical Training Command. He will assume the acting rank of air marshal.

At present A.V-M. Beamish is A.O.C.-in-C. Transport Command, which post A.V-M. A. McKee, C.B., C.B.E., D.S.O., D.F.C., A.F.C., will take over in October.

In September A. Cdre. H. A. V. Hogan, D.F.C., with the acting rank of air vice-marshal, will become A.O.C. British Forces Aden, an appointment which will allow the present commander, A.V-M. S. O. Bufton, C.B., D.F.C., to return to the United Kingdom in order to take up a new post as S.A.S.O. at Bomber Command H.Q.

The fifth appointment is that of A. Cdre. R. C. Mead, C.B.E., D.F.C., A.F.C., A.D.C., to become A.O.C. No. 81 Group, Fighter Command, in August, a post now held by A. Cdre. Hogan.

A.V-M. Beamish has been A.O.C.-in-C., Transport Command, since early 1954. Previous to that he was Director-General of Personnel (11) at the Air Ministry, A.O.C. Iraq, and Commandant of the Royal Air Force College, Cranwell. His wartime service was mainly in the Middle East and Mediterranean theatre. As a young man he was a famous rugby international; he was capped six times for Ireland and captained the Irish XV in 1932.

A.V-M. McKee has, since October 1953, been S.A.S.O., Bomber Command, with which he spent most of the war. Since the war he has been A.O.C. No. 205 Group, Egypt, S.A.S.O., Mediterranean and Middle East Command, Commandant of the Officers' Advanced Training School, Commandant of the R.A.F. Flying College at Manby, and A.O.C. No. 21 Group, Flying Training Command.

A.V-M. Bufton has been A.O.C., British Forces, Aden, since October 1953. During the war he served with Bomber Command and as Director of Bomber Operations at the Air Ministry, and since has been Director of Weapons at the Air Ministry, Deputy Chief of Staff (Operations and Plans) at Headquarters, Air Forces Western Europe (now Allied Forces Central Europe), and A.O.A., Bomber Command.

A. Cdre. Hogan became A.O.C., No. 81 (Fighter) Group, in April 1954 after being Northern Sector Commander, Fighter Command. He served in France early in the war and commanded a Hurricane squadron at Croydon during the Battle of Britain.

A. Cdre. Mead was Director of Flying Training at the Air Ministry from December 1952 until last January when he attended the Senior Officers' War Course at Greenwich. While commanding a Coastal Command squadron during the war he was second pilot of a Halifax which, following a successful attack on a U-boat, was shot down. He and five other survivors drifted for eleven days in a dinghy in the Bay of Biscay before being picked up.

C.F.S. Team Visits America

A TEAM of nine officers from the Central Flying School, Little Rissington, led by the Commandant, A. Cdre. G. I. C. Paul, D.F.C., is at present visiting flying training units of the Royal Canadian Air Force, the United States Air Force and the U.S. Navy. They left by B.O.A.C. on May 7th and the tour is expected to last until May 28th. This tour follows a visit paid to R.A.F. flying training units last year by Canadian and American service representatives.

Washington Post

THE appointment is announced of G/C. G. F. W. Heycock, D.F.C., as Senior Air Staff Officer, British Joint Services Mission, Washington, D.C.

When war broke out G/C. Heycock was a pilot in the experimental section at the Royal Aircraft Establishment and later, during the Battle of Britain, commanded No. 23 Squadron—then a night fighter squadron equipped with Blenheims. Other wartime appointments included command of West Raynham, a Mosquito base. G/C. Heycock has held a variety of posts since the war, one of which was as Director of Operations to the Indian Air Force.

R.Aux.A.F. Summer Training

DURING the next few months sixteen Royal Auxiliary Air Force fighter squadrons will fly overseas for their fortnight's summer camp. Eight will go to Germany and eight to Gibraltar. The remaining four will spend summer camp at fighter stations in England.

Of the squadrons for Germany, four will go to R.A.F. Wunstorf. They are Nos. 600 (City of London), Biggin Hill; 601 (County of London), North Weald; 604 (County of Middlesex), North Weald; and 615 (County of Surrey), Biggin Hill. The other four squadrons, which will go to R.A.F. Celle, are: Nos. 500 (County of Kent), West Malling; 609 (West Riding), Church Fenton; 611 (West Lancashire), Hooton Park; and 616 (South Yorkshire), Finningley.

The squadrons going to Gibraltar are: Nos. 501 (County of Gloucester), Filton; 502 (Ulster), Aldergrove; 603 (City of Edinburgh), Turnhouse; 605 (County of Warwick), Honiley; 607 (County of Durham), Ouston; 608 (North Riding), Thornaby; 613 (City of Manchester), Ringway; and 614 (County of Glamorgan), Llandow.

More than 2,000 members of the Women's Royal Auxiliary Air Force, including 80 officers, will shortly start their 14 days' annual summer training.

To Command H.M.A.S. 'Melbourne'

AT present Australian Naval attaché in Washington, Capt. G. G. O. Gatacre, D.S.O., D.S.C. and Bar, R.A.N., is to command the Australian aircraft carrier H.M.A.S. *Melbourne* when she begins her first commission next October.

Honour for R.A.F. Abingdon

AT a recent ceremony attended by Lord de L'Isle and Dudley, V.C., Dr. G. Fitzgerald O'Connor, the Mayor of Abingdon, handed to G/C. S. P. Hagger, who commands R.A.F. Abingdon, a casket containing a scroll recording the granting of the freedom of entry to the borough, with leave to march through the town "with bayonets fixed and colours flying."

R.Aux.A.F. Appointment

THE Air Ministry has announced the appointment of S/L. T. E. Johnson, D.F.C., to command No. 612 (County of Aberdeen) Squadron, R.Aux.A.F.

S/L. Johnson, who is a Regular officer, served much of the war as a pilot in the Middle East with Nos. 43, 601, 92 and 253 Squadrons. Since the war he has held a number of training appointments.

Reunion

THE fifth annual reunion of No. 80 Squadron will be held at the Prince of Wales, Drury Lane, London, W.C.2, on Saturday, June 4th, at 7 p.m. All ranks who have served with the squadron are invited to attend.

Tickets (13s) and particulars may be had from Mr. N. Garfoot, 80 Redway Drive, Whitton, Middlesex.

With 75,000 hours airline service increasing at the rate of 1,200 hours a week, the Viscount is well ahead in practical operating experience. It is in service with 6 operators including Trans-Canada Airlines and Capital Airlines, U.S.A.

"In Europe B.E.A.'s success with the Viscount has caused an undercurrent of anxiety—the carefully negotiated structure of pooled routes may be threatened if new equipment like the Viscount pulls a disproportionate number of passengers to a single operator". *Aviation Week.*

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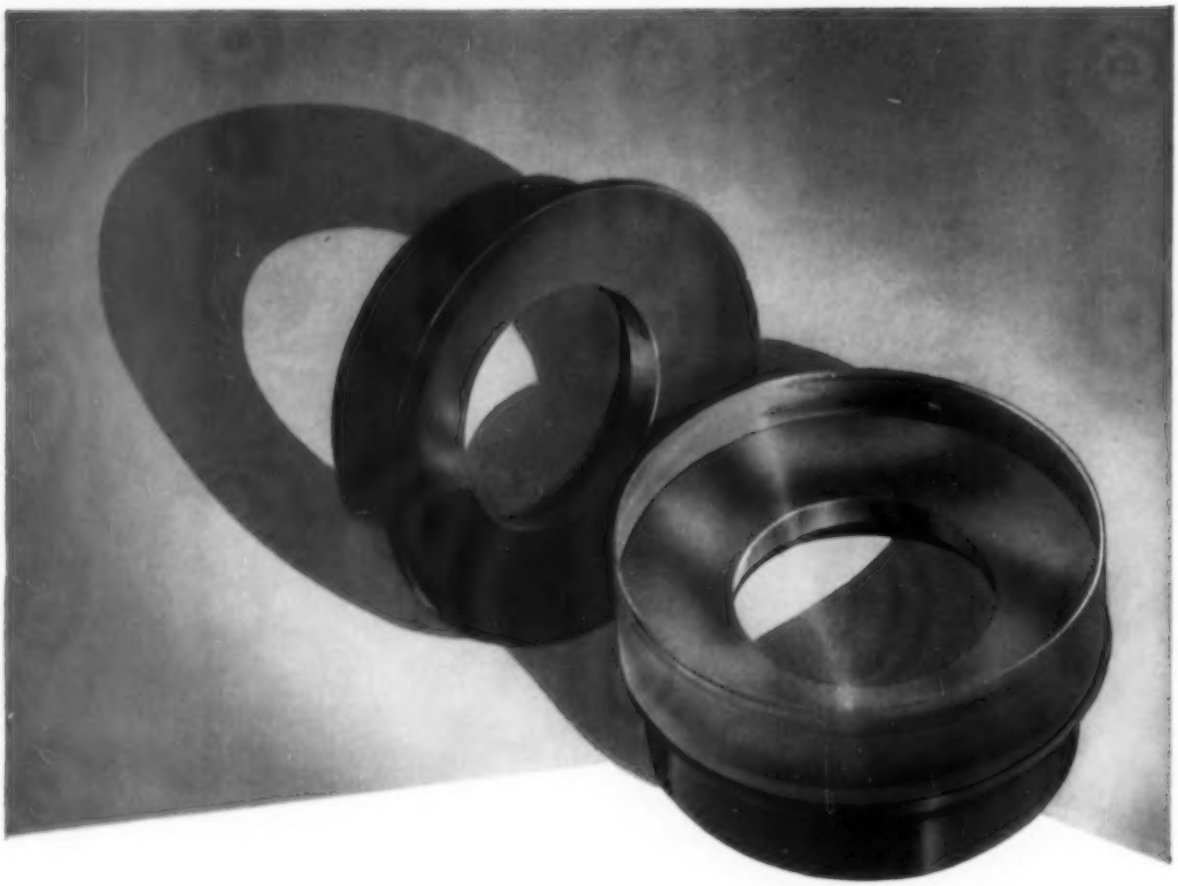

The optical maker's art is applied in producing camplates of super finish and accuracy for 2,000 p.s.i. fuel pumps. Three basic pumps cover present engine requirements with deliveries of 460 to 2,800 gallons per hour.

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The World's Air Forces

Their Composition, Duties and Aircraft

FROM time to time, over a period of many years, *Flight* has reviewed the military aircraft of all nations. On this occasion we inquire for the first time into the national air forces themselves—their organization, strength, equipment and, where divulged, their future plans. A data table shows the salient characteristics of a great multitude of aircraft and a special section is devoted to national insignia. The authors have been gratified by the ready compliance of most of the authorities concerned, and the work stands as a unique compendium. Not inappropriately, NATO is accorded pride of place. Thereafter the air forces are reviewed alphabetically.

NATO

THE SUPREME Allied Commander Europe, General Alfred M. Gruenther (U.S.A.), has as his Air Deputy General Lauris Norstad (U.S.A.). His air commanders are: Allied Air Forces Central Europe, Air Chief Marshal Sir Basil Embry (U.K.); Allied Air Forces Northern Europe, Maj-Gen. W. R. Carter (U.S.A.); Allied Air Forces Southern Europe, Maj-Gen. Patrick W. Timberlake (U.S.A.).

Air Marshal Sir John Boothman (U.K.) is both Air Commander-in-Chief Eastern Atlantic Area and Air Commander-in-Chief Channel and Southern North Sea.

NATO's largest air command is Allied Air Forces Central Europe (AAFCE), comprising the 4th A.T.A.F. (U.S., French and Canadian), the 1st Canadian Air Division, the 1st CATAC (France), and the 2nd A.T.A.F. (U.K., Netherlands and Belgium). Allied Air Forces Northern Europe has ten squadrons of the Royal Norwegian Air Force and eight squadrons of the Royal Danish Air Force. Allied Air Forces Southern Europe is made up of the 6th A.T.A.F. (Italy, Greece and Turkey), a large Italian contribution and Greek, Turkish and Portuguese squadrons.

Britain's contribution is the 2nd Tactical Air Force, with which, since 1952, have been co-ordinated squadrons and wings from Belgium and the Netherlands, to form the 2nd Allied Tactical Air Force (2nd A.T.A.F.). Three Belgian wings were integrated during 1952/53, and Netherlands integration is now all but complete. The Dutch element is rapidly growing. For added support, certain Netherlands bases, equipped, like the new NATO bases, with the most modern facilities for jet fighters, have been placed under 2nd A.T.A.F.'s operational control, and to increase reconnaissance strength a Netherlands unit has been assigned as part of an R.A.F. reconnaissance wing based at Laarbruch, one of the largest NATO bases in Europe. Other bases have been occupied by a light bomber wing, now equipped with Canberras.

In 4th A.T.A.F. integration of the U.S., French and Canadian elements has not proceeded below headquarters level, but frequent cross-training programmes, with transfer of pilots and aircraft from one national base to another, have resulted in greatly increased standardization and flexibility.

In the 12th Air Force, which constitutes America's commitment to NATO air strength, two fighter/bomber wings and two fighter/intercepter wings have been equipped during the past year with North American F-86Ds and F-86Fs. Two of the tactical reconnaissance wings are in process of receiving Martin-built RB-57s (licence-built English Electric Canberras), and Martin TM-61 guided missiles having atomic capability, have been assigned to the force. Support facilities have been increased in recent months by three new bases in France, with another two in process of completion.

NATO-assigned wings of the R.C.A.F., organized into the 1st Canadian Air Division, have undergone a year of growth and consolidation which has seen the fourth and final fighter base added to the command (at Marville, France). The new Mk 5 (Orenda-powered) Sabres have arrived in strength, and additionally the Canadian Government has announced its intention of equipping part of its twelve NATO squadrons with Avro Canada CF-100 twin-jet all-weather fighters.

France's contribution, the *Premier CATAC*, consists of fifteen squadrons which, through recent re-grouping of technical, administrative and ground-defence facilities, have been established on five operational bases. Much progress has been made in electronics, both in radar and in the use of micro-wave communication circuits. Strength has increased with the re-equipment of two complete wings with Dassault Ouragans, and soon the NATO squadrons, like certain French national units, will be receiving Mystère IVAs.

The following is an official NATO account of the operational tasks and commitments of AAFCE, prepared especially for this issue of *Flight* and touching on some weighty matters with notable candour:—

"In most military theatres close to the Soviet bloc it is necessary to consider preparation for war in two different fields: first, that of the all-out war using all available weapons, and secondly, that of the restricted war, of the 'bush-fire' type, in which atomic weapons may not be used. In Central Europe the second type of war is extremely unlikely. Such a localized outbreak is usually provoked by vague boundaries, indeterminate policies of bordering countries, civil wars, etc. In Central Europe, on the other hand, the border is defined, the nations are aligned into two camps by treaty, and the possibilities of civil war in the neutral countries are remote. The headquarters of Allied Air Forces Central Europe (AIRCENT) can therefore, while not losing sight of the possibility of a small war, devote its preparations almost entirely to readiness for an all-out war.

"If AIRCENT is to prepare for an all-out conflict it must bear in mind the vital fact that its own operations will be fought within the framework, as it were, of the strategic slugging-match between the contesting powers. While the respective strategic air forces and air defence systems attempt to achieve or to parry the final decision, AIRCENT's mission is to fight a battle jointly with the armies of Central Europe to prevent the Red Army and air force from overrunning the Continent during the duration of the strategic war. Thus our task is seen as that of offensively defending our territory and destroying the forces opposing us while we simultaneously attempt to preserve as much of Europe as possible from destruction by the Red air force.

"To do this we build our campaign around the tactical atomic bomb. The conventional tactical air forces assigned to AIRCENT are equipped and organized after the classic pattern which has been developed directly from World War II. This is because they support armies that are similarly developed. The spearhead of atomic power, however, expressed by the tactical atomic bomb, is now in a position to exert itself as the tactical weapon outstripping all others in its impact on the enemy forces. But while these weapons remain restricted in numbers their delivery must be supported, exploited, and supplemented in every possible way by fighters, fighter-bombers, and reconnaissance aircraft of the conventional unit. Thus, though the tactical atomic bomb will do the major damage to the enemy's forces, its crushing blows must be followed up by large-scale offensive and exploiting action of conventional aircraft working both by day and night attempting to destroy the parts of the enemy forces surviving after the atomic bombers have done their work.

"The enemy tactics and techniques will of necessity have undergone great changes as a result of the advent of nuclear warfare. He will make every effort to elude our atomic blows by dispersing both his air and ground forces, and also by attacking us on the ground in formations sufficiently dispersed to make atomic attack uneconomic. The fighter-bombers, night bombers and recce aircraft of the conventional units will therefore be heavily engaged in direct and indirect support of the army as it struggles to contain this type of enemy attack, and must simultaneously strive to produce situations onto which atomic attack can be made profitable.

"Reconnaissance operations in support of a force partly atomic and partly conventional, must be available in greater proportions than have hitherto been standard calculations for tactical air forces. When a single fighter-bomber is capable of delivering a blow equal to 2,000 heavy aircraft of World War II, the reconnaissance effort which should be considered adequate to place this blow where it would do the most harm is necessarily greater in terms of proportions of aircraft in the force. To achieve the best results in atomic attack it is highly desirable, if at all possible, to have such photographic cover of the target as will enable a study to be made to determine the most suitable delivery of the weapon. Bomb damage assessments must be made, and the compression of operations into a very short time dictates a lavish use of all types of reconnaissance aircraft and a tremendous problem in processing.

"AAFCE has the responsibility, through its assigned forces, of the air defence of the forward tactical areas and of the civil populations and military installations therein. Though this problem is still in course of resolution, the Supreme Commander has agreed with AIRCENT opinion that the present division of air defence areas between nations and forces is unsatisfactory, and must be bettered. If this problem is to be properly solved nations will have to yield some of their defence prerogatives to NATO, but they are rapidly becoming convinced of AIRCENT's opinion that with the speeds and heights used by modern aircraft one country is too small an area to be a self-contained air defence unit.

"AIRCENT must also have operational plans prepared for action against Baltic ports and port facilities, that can sustain operations against CINCNORTH's area, and must likewise be

Gloster Meteor F.4s (Argentine A.F.).

I.Ae.24 Calquin (Argentine A.F.).

Convair Catalina amphibians (Argentine Naval Air Arm).

Grumman J2F-2 amphibians (Argentine Naval Air Arm).

Beech AT-11s (Argentine Naval Air Arm).

THE WORLD'S AIR FORCES . . .

prepared to take action against shipping in the Baltic, particularly submarines, which may be attempting to force the northern flank.

"Right at the cross-roads of this intricate land/air/sea problem stands AAFCE. Into its two Allied Tactical Air Forces, requiring the normal command and co-ordination needed from a higher headquarters, must be applied the external forces of atomic delivery from SACEUR's assigned squadrons, and possibly those of SAC and SACLANT also, together with the aircraft of U.K. Bomber Command. Any other external force must be fed in as needed, such as reconnaissance by special units, air transport, or any assistance applied from outside to the forces of Central Europe.

"Most of the work of AAFCE consists of the unification of national units into a single functioning air force. It is increasingly apparent that there will be no time to spare, when war begins, for any preparatory work. Everything must be pre-planned to the highest degree possible. In particular, AAFCE believes that we must fight a war with what we have, in the formations and positions that we have it in. Calling up reserves, reorganizing according to "war establishment," redeploying units and activating new formations—none of these seem likely to be effective in the tactical zone in a war that will come swiftly and very well end in a matter of days after it has begun. No reservist would even have got his bearing before it would all be over."

AFGHANISTAN

The Royal Afghan Air Force

AVRO ANSON 18s are used by this Service for transport and training, and there are a few light aircraft for general duties. Plans provide for new equipment, including fighters.

ARGENTINA

The Argentine Air Force

THE OPERATIONAL strength of this Service is comprised in bomber, fighter, intercepter fighter, attack and transport regiments, and there are groups for reconnaissance and training. Modern instructional facilities are provided at Cordoba. An appreciable quantity of Argentine-built equipment is in service, including I.Ae.24 Calquin attack bombers and I.Ae.D.L.22 trainers, but material is predominantly British and American. For fighting there are Gloster Meteor F.4s, and for bombing Avro Lincolns. Transports include Douglas Skymasters and Dakotas, Bristol Freighters and D.H. Doves, and Vickers Vikings, and trainers are Beechcraft AT-11s, North American AT-6s and Fiat G.46s. The indigenous swept-wing Pulqui II single-jet fighter, designed by Kurt Tank, is not operational; a delta-wing intercepter fighter, powered with two axial-flow turbojets and designated Pulqui III, is under construction. Interest has been expressed in the acquisition of 25 Lockheed T-33s.

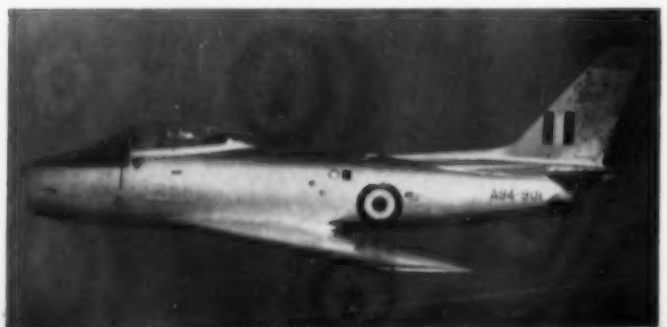
The Argentine Naval Air Arm

THIS ARM is controlled by a command under Naval Operations and its task is to operate as far out to sea as possible and along the coast, in co-ordination and co-operation with other naval forces. Its aircraft are distributed amongst a number of zones, parallel with other naval forces, but their main concentrations are at the Naval Air Bases *Punta Indio* and *Commandante Espora*, whence, organized into squadrons, they are operated for attack, bombing, observation, patrol, transport and training. Most of the aircraft are American, but some British material is on charge, including Supermarine Walrus, which are still being carried aboard certain ships. American types are the Stearman PT-17, Vultee BT-13, North American AT-6, Beechcraft AT-11, Grumman Goose, Grumman F6F, Convair Catalina PBY-5, Martin Mariner PBM, Douglas C-39 and C-54, and Bell 47 and Sikorsky S-55 helicopters. Plans include the purchase of equipment for anti-submarine and convoy patrol.

Principal commanders: Commander of the Fleet Air Arm: Capt. (Capitan de Navio) Gregorio Lloret; Chief of Staff, Capt. (Capitan de Navio), Roberto C. Robles; Chief of Services, Cdr. (Capitan de Fragata) Raul I. Gonzalez Vergara; Chief of Technical Department, Cdr. (Capitan de Fragata) Federico Hachard; Commander of the Air Force of the Maritime Area, Cdr. (Capitan de Fragata) Richardo Ezcurra; Commander of the Air Force of the "Rio de la Plata" Area, Cdr. (Capitan de Fragata) Abel R. Trebino; Director of the Air Naval School, Cdr. (Capitan de Fragata) Ernesto Lessa.

Australian-built English Electric Canberra B.20 (R.A.A.F.).

Australian-built Avon-Sabre (R.A.A.F.).



AUSTRALIA

The Royal Australian Air Force

THE PERMANENT strength of the R.A.A.F., including members of the Women's Royal Australian Air Force, is 15,000, a figure which will be increased by nearly 2,000 over the next three years. Operational units are organized under Home Command, with headquarters at Penrith, near Sydney, and training units are administered by Training Command, with headquarters in Melbourne. Technical units are grouped under Maintenance Command, likewise with headquarters in Melbourne.

There are three main Wings. The first of these is No. 78 Wing, based at Williamtown, N.S.W., and comprising Nos. 75, 76 and 77 Squadrons (No. 77 Squadron returned last December from Korea, and Nos. 75 and 76 were based in Malta until February last). The second wing—No. 82 Bomber Wing, based at Amberley—is composed of Nos. 2 and 6 Squadrons, themselves located at Amberley, and No. 1, which is on detachment to Singapore. No. 86 Transport Wing is based at Canberra. Additionally there are two Maritime Reconnaissance Squadrons—No. 10 at Townsville, and No. 11 at Richmond, N.S.W. It is intended to group these within a Maritime Wing, for which a special headquarters will be formed.

In war the R.A.A.F. would have three main tasks: (1) the provision and maintenance of a task force; (2) fighter defence at home; (3) protection of sea lanes. In recent months overseas commitments have been greatly reduced, so that today only one unit (No. 1 Squadron, equipped with Lincolns) is maintained abroad, i.e., at Singapore. Additionally two Dakotas still provide transport support for the British Commonwealth Forces Korea, in Japan. Home commitments include air-sea/search and rescue under I.C.A.O.; and there is a continuing responsibility all over the Continent in patrolling for bush fires. The training programme for this year, however, has an operational emphasis. Every squadron, including the five Citizen Air Force Squadrons (which are more or less equivalent to Britain's R.Aux.A.F. Squadrons) will be stationed at Darwin to gain tropical experience under operational conditions; and there will be two large-scale exercises, based on the air defence of Sydney. There is always a fairly large commitment for inter-Services co-operation, such as air/sea and anti-submarine exercises with the Royal Australian Navy, and army/air co-operation, and V.I.P. transport is provided for the Governor-General, the Prime Minister and others.

In the matter of equipment, the R.A.A.F. is now being armed with an intercepter fighter of outstanding merit. This is the Avon-Sabre, 90 of which have been ordered from the Commonwealth Aircraft Corporation factory near Melbourne. Avon-Sabres are now re-equipping No. 78 Fighter Wing, wherein they are replacing the Meteor F.8s which returned from Korea with No. 77 Squadron. Nene-powered Vampire F.B.30s, produced by the de Havilland Aircraft Co. (Pty.), Ltd., at Bankstown, near Sydney, are now replacing Mustangs in the Citizen Air Force Squadrons.

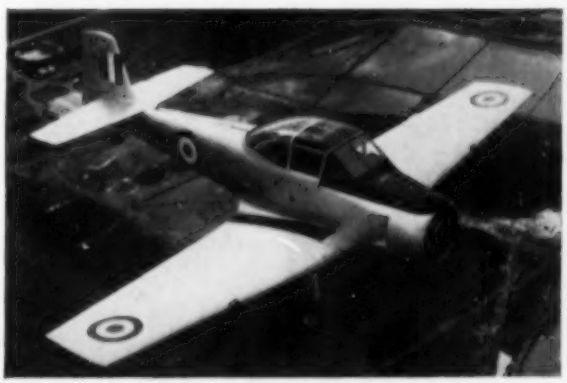
Bomber squadrons of the R.A.A.F. are progressively being re-equipped with English Electric Canberra B.20s, produced in the Government Aircraft Factory near Melbourne. No. 2 Squadron is already fully equipped; No. 6 is in process of re-equipment; and No. 1, which is still operating Lincolns, is scheduled to get Canberras eventually. No. 86 Transport Wing is equipped with Dakotas; No. 10 Squadron operates an Australian adaptation of the Avro Lincoln (this has a special nose section, lengthened by 6ft, to accommodate additional equipment for the maritime role); and No. 11 Squadron is operating Lockheed Neptune P2V-5s.

The standard jet trainer is the D.H. Vampire T.33 and of those on order half are being produced at Bankstown. Other standard trainers are the D.H. Tiger Moth, the Commonwealth Wirraway, and the C.A.22 Winjeel, a primary, similar in character to the

Avro Lincoln B.20s (R.A.A.F.).

Avro Lincoln (maritime conversion) R.A.A.F.

Douglas Dakota (R.A.A.F.).



Commonwealth Winjeel (R.A.A.F.).

de Havilland Venom FAW.53 (R.A.N.).

Fairey Firefly A.S.6 (R.A.N.).

Lockheed Neptune P2V-5 of No. 11 Sqn., R.A.A.F.

Republic F-84 Thunderjets (Belgian A.F.).

Gloster Meteor F.8s (Belgian A.F.).

A.W. Meteor N.F.11 (Belgian A.F.).

Douglas DC-4 (Belgian A.F.).

THE WORLD'S AIR FORCES . . .

Hunting Percival Provost, is now in production at the Commonwealth Aircraft factory. Replacements for the Sabre, Canberra and Dakota are intended to enter service about 1959.

Principal commanders of the R.A.A.F.: Chief of Air Staff, Air Marshal Sir John McCauley; A.O.C.-in-C. Home Command, A. V-M. A. L. Walters; A.O.C.-in-C. Training Command, A. V-M. A. M. Murdoch; A.O.C. Maintenance Command, A. Cdre. W. S. Armstrong; C.O. 78 Fighter Wing, G/C. W. E. Townsend; C.O. 82 Bomber Wing, G/C. D. L. G. Douglas.

The Royal Australian Fleet Air Arm

THE Fleet Air Arm of the R.A.N. consists of five front-line squadrons (which are moved, not in groups, but as separate entities, to give greater flexibility) and two second-line squadrons. The second-line units are administered by the Flag Officer-in-Charge, East Australian Area, who also administers disembarked front-line squadrons in conjunction with the Flag Officer Commanding, H.M. Australian Fleet—the administrative authority for embarked front-line squadrons. In commission are one operational carrier, H.M.A.S. *Sydney*, and one training carrier, H.M.A.S. *Vengeance*. All second-line squadrons and disembarked front-line squadrons are based at the R.A.N. Air Station, Nowra, N.S.W. Standard aircraft are the Fairey Firefly A.S.6, and Hawker Sea Fury F.B.11.

Future planning concerns both carriers and aircraft. Thus, H.M.S. *Majestic*, which will commission as H.M.A.S. *Melbourne* in December this year, will return to Australia in early 1956 to become the operational carrier; the role of training carrier will be taken over by H.M.A.S. *Sydney*. H.M.A.S. *Vengeance*, which is on loan, will be returned to the Royal Navy in August. This year, too, will see two anti-submarine squadrons re-equipped with Fairey Gannet A.S. 1s and one fighter squadron will be re-armed with the de Havilland Sea Venom FAW.53.

Principal commanders of the R.A.N. Fleet Air Arm: C.O., H.M.A.S. *Sydney*, Capt. G. C. Oldham; C.O., R.A.N. Air Station, Nowra, Capt. P. E. Fanshawe; C.O., No. 816 Air Squadron, Lt-Cdr. (P) D. J. Robertson; C.O., No. 817 Air Squadron, Lt-Cdr. (P) J. D. Goble; C.O., No. 851 Air Squadron, Lt-Cdr. (P) D. C. Johns; C.O., 805 Air Squadron, Lt-Cdr. (P) F. T. Sherborne; C.O., No. 808 Air Squadron, Lt-Cdr. (P) G. M. Jude; C.O., No. 723 Air Squadron, Lt-Cdr. (P) J. G. B. Campbell; C.O., No. 724 Air Squadron, Lt-Cdr. (P) L. A. Robinson.

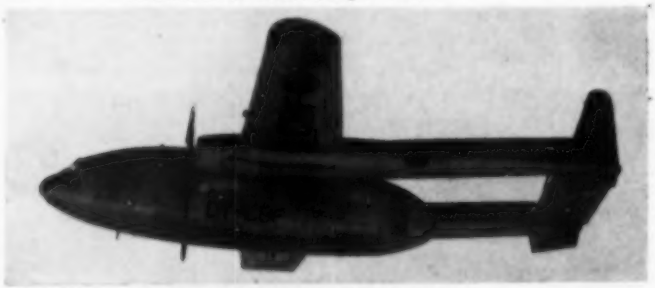
BELGIUM

The Royal Belgian Air Force

PLACED UNDER the authority of the Minister of National Defence, the Belgian Air Force is an independent arm, responsible for air defence and for the support of ground forces, when the situation permits. The operations group commands and controls the defensive wings and another wing concerned with transport and communications. Several ground-support wings are integrated in the Anglo-Belgian No. 83 Group, 2nd A.T.A.F. In principle each wing has three squadrons, charged with day and night fighting, ground support, and transport and communications. The A.O.P. squadrons are under the direct control of the Belgian Artillery. The operations group co-operates with the corresponding formation of the Netherlands Air Force, under the direction of a Belgo-Netherlands General Staff (No. 69 Group) the chief of which is alternatively Belgian or Dutch.

The standard day fighter in the interception wings is the Gloster Meteor F.8, but this type will gradually be replaced by the Hawker Hunter. Armstrong Whitworth Meteor N.F.11s serve as night fighters and Republic Thunderjet F-84Es and Gs are the standard fighter/bombers in the tactical-support wings. Both variants will progressively be replaced, during this year, by F-84F Thunderstreaks. This year also Republic RF-84F Thunderflashes will be delivered for photographic reconnaissance. Jet trainers are the Meteor 4 and 7, and the Lockheed T-33A. For heavy transport and paratrooping there are Fairchild C-119s, and for the Belgium/Belgian Congo passenger service, DC-4 Skymasters. There are Dakotas for passenger and freight transport and navigational instruction, and Hunting Percival Pembrokes for liaison, photography and ambulance duties. Airspeed Oxfords serve for liaison and Bristol Sycamore 4s for rescue work. Standard trainers are Tiger Moths, S.V.4s, and Harvards. Auster A.O.P.6s and Piper L-18Cs are used for observation.

Fairchild C-119 Boxcar (Belgian A.F.).



Douglas C-47 Dakotas (Belgian A.F.).

Stampe S.V.4s (Belgian A.F.).

Principal commanders: Chief of Staff, Lt-Gen. L. Leboutte; Inspector General, Lt-Gen. H. de Bock; Chief of Personnel and Administration, Gen-Maj. Fr. Niset; Chief of Supply, Gen-Maj. G. Duchateau; Chief of Instructional Training Group, Gen-Maj. L. de Soomer; Chief of Operations Group, Col. Fr. Burniaux; Chief of Technical Group, Col. Fr. Carlier; S.A.S.O. 83 Group, Col. M. Donnet.

BOLIVIA

The Bolivian Air Force

HEADQUARTERS OF the Bolivian Air Force are at La Paz. Aircraft in service are Douglas C-47 Dakota, Beechcraft AT-11 Expediter, Boeing BT-17 Kaydet, North American AT-6, and Vultee BT-13 Valiant.

BRAZIL

The Brazilian Air Force

THE FIGHTING strength of this Force is concentrated in squadrons of Gloster Meteor F.8s, some 60 of which were procured in 1953, in addition to ten T.7 trainers. Orders have been placed with Fokker Industria Aeronautica S.A., of Rio de Janeiro, for a hundred S.11s and S.12s, and fifty S.14 Mach Trainers, the latter to be powered by the Rolls-Royce Derwent. Small numbers of Republic F-47 Thunderbolts remain in service, together with North American Mitchells, Mustangs and Harvards, Beechcraft AT-11s, Fairchild PT-19s and North American AT-6s. Dakotas and Lodestars are used for transport, Catalinas for patrol and survey, and Grumman Goose amphibians for liaison and rescue.

BULGARIA

The Bulgarian Air Force

SOVIET TYPES supplied to the Bulgarian Air Force have included Yak-9 fighters, Il-2 ground-attack aircraft, Pe-2 twin-engined bombers and Po-2 trainers. Ju 52s are also used.

BURMA

The Burma Air Force

THE MAIN base of this Force is at Mingaladon, and the most modern first-line aircraft is the D.H. Venom F.B.50. Hunting Percival Armed Provosts and D.H. Vampire Trainers have also been acquired. Earlier types are the Supermarine Spitfire, D.H. Mosquito 6, Airspeed Consul and Oxford, Austers and Tiger Moths.

CANADA

The Royal Canadian Air Force

THE STRENGTH of the R.C.A.F. on October 31st last was 48,144 active personnel, with 5,466 on the reserve. A month previously the force possessed 2,530 aircraft of some 21 types, and 38 of the 41 squadrons planned had then been organized. Post-war planning had entailed the setting up of the training scheme along new lines, and a construction programme providing modern airfields and facilities had been put in hand.

It had been decided to concentrate on fighter, maritime and transport elements, and though tactical support was not to be overlooked, it was considered that strategic bomber operations would stretch resources to a point where no operational element would be more than a token force. With the object of introducing jet propulsion into the R.C.A.F. a number of Vampires were procured. Plans were laid, too, for the acquisition of Canadair-built F-86 Sabres and Avro Canada CF-100 all-weather fighters, these latter being designed specifically for Canadian requirements because no other suitable type existed.

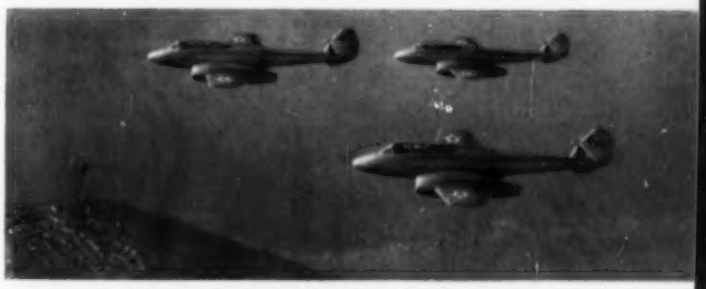
As the international situation worsened, the "ceiling" was gradually increased until, in 1951, the R.C.A.F. began its current expansion. In addition to building up its own strength, the Service had to plan for the training of NATO aircrew.

Equally vital was the construction programme, expected to run into an expenditure of $400 million before completion, and under which, stretching across Canada and into the Northland, there will be new or expanded operational and training stations, supply and repair depots, command and station H.Q.s and radar stations. A major item is the lengthening of runways, for the majority of those built in war-time were required to serve trainers only.

Overall R.C.A.F. policy is directed from Air Force Head-

Hunting Percival Pembroke (Belgian A.F.).

Bristol Sycamore 4 (Belgian A.F.).



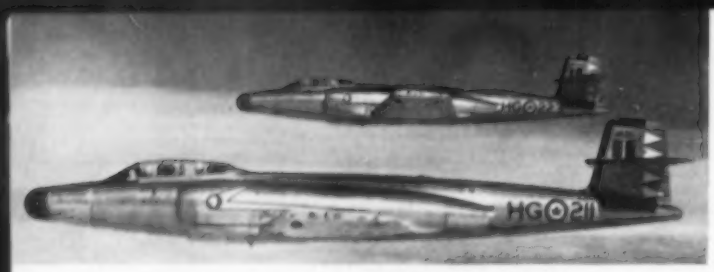
Gloster Meteor T.7s (Brazilian A.F.).

D.H. Vampire T.55s (Burma A.F.).

Hunting Percival Provost (Burma A.F.).

Canadair-built Orenda-Sabres (R.C.A.F.).

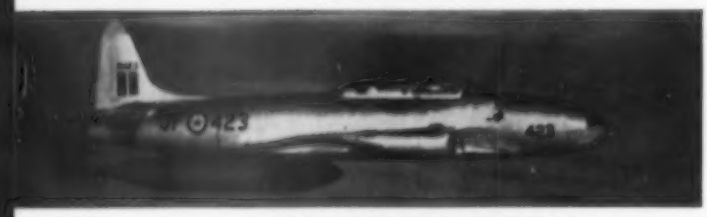
THE WORLD'S AIR FORCES . . .



Avro Canada CF-100s (R.C.A.F.).

Lockheed P2V-7 Neptune (R.C.A.F.).

Avro Lancaster M.R.10 (R.C.A.F.).



Lockheed T-33A-N Silver Star (R.C.A.F.).

CanCar-built North American Harvards (R.C.A.F.).

Canadair North Star (R.C.A.F.). Below, Fairchild C-119 (R.C.A.F.).

quarters in Ottawa, which delegates responsibilities to command and group headquarters across Canada. Aerial protection is the responsibility of Air Defence Command, centred on St. Hubert, outside Montreal. The early-warning and ground-control system necessitated is tremendously complex and expensive; but it is already operating (is, in fact, nearly complete), while plans for a second early-warning chain, north of the existing one, have been announced. Another vital part of the air defence system is the Ground Observer Corps, directed by Air Defence Command and with regular Force officers at certain points, though depending largely upon civilian volunteer spotters or observers. Canada's Air Defence Command works closely with that of the U.S.A.F., and the two systems are geared to act together in war. Numerous exercises have afforded training to this end.

While the last home-based CF-100 squadrons have been forming and new sections of the early-warning system have been under construction, Canada has been adding finishing touches to its NATO force of twelve fighter squadrons in Europe—a force, be it said, which was "on location" well ahead of schedule. Under the operational control of NATO, Canada's Air Division has headquarters at Metz whence it administers the R.C.A.F. Fighter Wings, each located at a different base and each composed of three squadrons of Canadian-built Sabre F.5s, with Avro Canada Orenda turbojet.

Maritime Air Command has headquarters at Halifax, Nova Scotia, and is responsible for naval co-operation, including submarine detection, reconnaissance and convoy patrol. Its squadrons operate on east and west coasts, mainly equipped with specially modified long-range Avro Lancasters. Lockheed Neptunes, however, are already coming into service and a special "M.R." version of the Bristol Britannia is on order. Maritime Air Command forms a sub-component of the NATO Atlantic headquarters at Norfolk, Virginia, and as such participates in NATO exercises involving naval and air forces over the Atlantic.

Headquarters of Transport Command, the squadrons of which operate Canadair North Stars, Douglas Dakotas, Fairchild C-119s, Beechcraft Expediters, and other types, are at Lachine, outside Montreal.

One unit, No. 426 Squadron, flew regularly on the Korean air lift from July 1950 to June 1954. Scheduled supply flights are made to Goose Bay, in Labrador, to Whitehorse, in the Yukon, and Resolute, on Cornwallis Island, hundreds of miles within the Arctic Circle. There are regular trips, too, across Canada and to the United Kingdom. Air Transport Command also handles the photographic survey programme, and though much of the actual photography is undertaken by commercial companies, one squadron still sends detachments into the field each summer to operate over isolated parts of Canada or into the far Arctic.

Tactical Air Command has headquarters at Edmonton, and its main task is offensive- and transport-support operations. It controls four Auxiliary light bomber squadrons, equipped with North American B-25s, and would be able, in time of war, to call upon additional R.C.A.F. resources, including Air Transport Command's C-119s, designed for airborne operations and general transport duties. Because of its location the Command is further responsible for search and rescue, and for certain specialized training.

General training is handled by Training Command itself, with headquarters at Trenton, Ontario. The great centres for aircrew training are Centralia, Ontario (basic pilot training); Clinton, Ont. (radio training); and Summerside, Prince Edward Island (navigation training). Expansion, and the aid promised to other NATO nations, led to the opening of numerous additional flying schools. Thus, basic and advanced pilot training schools have been opened at Gimli, Man.; Claresholm, Alta.; Saskatoon, Sask.; Moose Jaw, Sask.; Penhold, Alta.; and Portage la Prairie, Man. An additional air navigation school has been established at Winnipeg and an Air Weapons School at Macdonald, Man. Other specialized flying training is given at Trenton and at Centralia, where, in addition to the basic pilot training school, there is the instrument-flying school. There are four Operational Training Units, operated by Air Defence Command (at Chatham, New Brunswick, and North Bay, Ont.); by Maritime Air Command (at Greenwood, Nova Scotia); and by Air Transport Command (at Trenton, Ont.). Equipment includes North American Harvards, Lockheed T-33 Silver Stars, North American B-25s, and D.H. Canada Chipmunks. Destined to play an important part in advanced training, as well as in missile development, is

Bristol Freighter (R.C.A.F.).

the weapons range, measuring some 40 miles by 150 miles, being established at Cold Lake, Alta.

Between the autumn of 1950 and August 1954 no fewer than 2,800 NATO aircrew had received training with the R.C.A.F. The NATO nations pay transportation costs to and from Canada, and continue pay and allowances for the trainees, while Canada absorbs the cost of actual training and provides accommodation, meals, etc.

Unique in the R.C.A.F. training programme is the Survival Training School operating in Northern Alberta and at Cambridge Bay, North West Territories, within the Arctic Circle. Air Materiel Command, with headquarters in Ottawa, is responsible not only for logistic support of the R.C.A.F., but for ferrying and for the control of the Central Experimental and Proving Establishment at Rockliffe.

Since July 1951, when recruiting opened, some 3,500 women have joined the regular force. There is no separate women's corps or group, as existed in the late war.

The regular R.C.A.F. is backed by a growing reserve, with air squadrons and ground training units. Then there is the "Chipmunk Scheme," providing refresher training to former R.C.A.F. pilots and the R.C.A.F. is associated with universities through an undergraduate reserve training programme. Constantly in the news is the search and rescue organization, with its para-rescue corps of men and women.

Principal commanders: Chief of the Air Staff of the R.C.A.F., Air Marshal C. Roy Slemon; Vice-Chief of the Air Staff is A.V-M. C. R. Dunlap.

Canadian Naval Aviation

THE main responsibility of the Royal Canadian Navy is the protection of trade, and its Naval Aviation components fit into this role with first-line squadrons of anti-submarine and fighter aircraft. Second-line squadrons are concerned with training, and fleet requirements. From time to time the squadrons are organized in air groups but remain essentially independent entities.

First-line strength is two anti-submarine squadrons and one fighter squadron; a second fighter squadron is being temporarily disbanded. Normally one squadron of each type is embarked in the light fleet carrier H.M.C.S. *Magnificent*, the other remaining in immediate support ashore at the R.C.N. Air Section of the R.C.A.F. Station Summerside, or at the R.C.N. Air Station designated H.M.C.S. *Shearwater*. Embarked average strength of an anti-submarine squadron is twelve A.S. and four A.E.W. (airborne early warning) aircraft. Present strength of a fighter squadron is ten machines. Administration is exercised from Naval Headquarters through the Flag Officers Atlantic and Pacific Coasts to the carrier and air stations.

A helicopter squadron and a experimental squadron are based at R.C.N.A.S. Dartmouth and there is, additionally, a composite training squadron (comprising an advanced training flight, an all-weather flight and a jet flight), and one utility (fleet requirements) squadron. This last is chiefly engaged in the flying training of Royal Naval and R.C.N. observers, in conjunction with the R.C.N. Observer School at H.M.C.S. *Shearwater*. A small fleet requirements unit operates at the R.C.N. Air Section, Patricia Bay, Victoria, B.C., and small reserve anti-submarine squadrons have been established at Toronto, Victoria, Quebec, Kingston and Calgary.

Participation of H.M.C.S. *Magnificent* in NATO exercises is becoming an annual event. Her anti-submarine squadrons have had encouraging success and her fighters have been effectively employed against shadowers and bombers. Throughout the year smaller exercises are conducted with other Commonwealth and NATO Navies. An interesting commitment is the provision of two helicopters for ice reconnaissance and Arctic re-supply for the ice-breaker H.M.C.S. *Labrador*, which last year made the Northwest passage from east to west across the top of Canada and Alaska.

Types of aircraft in service are: Grumman Avenger (anti-submarine, observer training and reserve training); Hawker Sea Fury F.B.11 (fighter/bomber); Lockheed T-33 (jet conversion and instrument training); Beechcraft Expediter (instrument training); North American Harvard (check, refresher, practice, and reserve training); Sikorsky HO4S-2 (plane guard and general purposes); Piasecki HUP-3 (ice reconnaissance and Arctic re-supply); Bell HTL-4 (ice reconnaissance, training and utility).

The R.C.N. is approaching a period of re-equipment both in ships and aircraft. A new light fleet carrier, H.M.C.S. *Bonaventure*, now building in the Belfast yard of Harland and Wolff, is to commission next year, and the McDonald Banshee F2H-4—a single-seat all-weather fighter—has been selected as the Sea Fury's successor. Somewhat belatedly the Banshee will usher in the jet age for Canadian Naval Aviation at the end of this year. Long out of production, the Avenger is now ending its lengthy service and will be replaced next year by the Grumman CS2F, as built under licence by de Havilland in Toronto. Increasing interest is being shown in the possibilities of anti-submarine helicopters.

D.H. Canada Otter (R.C.A.F.).

Piasecki H-21 Work Horse (R.C.A.F.).

Hawker Sea Fury F.B.11s (R.C.N.).

Grumman Avengers (R.C.N.).

Principal commanders: Assistant Chief of Naval Staff (Air), Cdre. 2nd Class Walter L. M. Brown; Director of Naval Aviation, Capt. A. B. F. Fraser-Harris; Deputy Director of Naval Aviation, Cdr. H. J. Hunter; Flag Officer Atlantic Coast, Rear-Admiral Roger E. S. Bidwell; Flag Officer Pacific Coast, Rear-Admiral James C. Hibbard; C.O., H.M.C.S. *Magnificent*, Capt. A. H. G. Storrs; C.O., H.M.C.S. *Shearwater*, Capt. D. G. King.

Piasecki HUP-3 Retriever (R.C.N.).

Boulton Paul Balliol T.2 (R.Cy.A.F.).

de Havilland Vampire Trainers (Chilean A.F.).

Beechcraft D-18S Expediters (Chilean Naval Air Arm).

Beechcraft Mentors (Chilean A.F.).

Republic F-84 Thunderjets (Chinese Nationalist A.F.).

Beechcraft Mentor (Colombian A.F.) (Below) U-Mig-15s (Czech A.F.)

CAMBODIA

The Cambodian Air Force

FOUR JAPANESE-BUILT Fletcher FD-25A Defenders have been acquired for this Service, and a batch of seven Morane Alcyons has been ordered (three as trainers and four for police duties, for which they will be armed with machine guns, rockets and bombs).

CEYLON

The Royal Ceylon Air Force

RESPONSIBLE TO the Ceylon Government for formulating and implementing the policy of the R.Cy.A.F. is the Commander of the Air Force, with headquarters in Colombo. At present the Force is organized on a three-station basis only. No. 1 Maintenance Unit is in Colombo and the Flying Unit is at Katunayaka, where it shares Negombo airfield with the R.A.F.

Shortage of aircraft at present obliges the R.Cy.A.F. to restrict its operations to co-operation with the Ceylon Army and illicit-immigration patrols. Present equipment is D.H. Chipmunks, Boulton Paul Balliols and Airspeed Oxfords, the Chipmunks and Balliols being used for pilot training to wings standard. All three types are engaged on army co-operation and advanced training is done on the Balliols. Immigration patrols fall to the lot of the Oxfords. Future plans include the formation of a composite squadron of Austers and helicopters for army co-operation, and the helicopters will be used also for air/sea rescue. It is also intended to establish a squadron of light transport aircraft (Doves and Herons) and to have two fighter squadrons with jet aircraft. A volunteer Air Force is planned.

Principal commanders: Commander of the Air Force, G/C. G. C. Bladon; Chief of Staff, W/C. A. E. Dale; O.C. Katunayaka, S/L. D. R. George; O.C. No. 1 M.U., F/L. K. Nagarajah; O.C. Diyatalawa, S/L. M. G. Wijayendran; O.C. Headquarters Unit, F/L. P. G. Walpita.

CHILE

The Chilean Air Force

EQUIPMENT supplied to this Force in post-war years has included Republic Thunderbolts, North American Mitchells, Convair Catalinas, Douglas Dakotas, Vought Kingfishers, Vultee PT-13s, Fairchild PT-19s, North American AT-6s and Beechcraft AT-11s. A number of Beechcraft D-18s tactical support and armament trainer aircraft were supplied last year.

THE PEOPLE'S REPUBLIC OF CHINA

The Chinese Air Force

OPERATIONAL STRENGTH of the Chinese Air Force is far in excess of a thousand aircraft, and the types available include several hundred jet-propelled Mig-15s, and La-9 and La-11 piston-engined fighters. Bombing equipment includes piston-engined Tu-2s and jet-propelled Il-28s, and a small quantity of Tu-4 (B-29 equivalent) long-range bombers has been reported. Manufacture of an unspecified type of aircraft has already begun, following assembly in China of Russian airframes. In recent months the Air Force has been deployed southwards to operate over the Strait of Formosa, and new airfields have been constructed.

NATIONALIST CHINA

The Chinese Nationalist Air Force

PRINCIPAL EQUIPMENT of this Force is Republic F-84 Thunderjet fighter/bombers. Pilots have been trained by American instructors at Tainan Air Force Base, southern Formosa.

COLOMBIA

The Colombian Air Force

IN MARCH last year six Lockheed T-33s were acquired by Colombia from the U.S.A.F.—the first transaction in which a South American nation purchased a U.S. jet aircraft under the Reimbursable Assistance Programme. There followed numerous requests from South and Central American countries for American jet aircraft. Earlier types in service with the Colombian Air Force are the Republic Thunderbolt, Convair Catalina, Douglas Dakota, North American AT-6 and Boeing PT-17.

CUBA

The Cuban Air Force

WE ARE informed that this Force is now being reorganized. Acquisition of four Lockheed T-33s has been reported; earlier types included North American Mitchells and Mustangs, Convair Catalinas, Douglas C-47s, Beechcraft Bonanzas, North American AT-6s, and Boeing PT-13s and PT-17s.

Republic F-84 Thunderjet (Royal Danish A.F.).

Boeing B-17 Fortress (Royal Danish A.F.).

CZECHOSLOVAKIA

The Czechoslovak Air Force

THE STANDARD fighter of the Czechoslovak Air Force is the Mig-15, which type is now in production at the former Avia plant. A training version of the Mig-15 (U-Mig-15) is also in service and participated in a fly-past over Prague in September last year. The standard bomber is thought to be the jet-propelled Il-28, and the commonest transport the Russian-built Li-2 (Dakota). Trainers include Czech-built versions of the Bucker Bu 181, Arado 96B and Siebel 204, and Pe-2 light bombers now serve for training. Reserve units fly Czech versions of the Me 109.

DENMARK

The Royal Danish Air Force

FORMING THE first-line equipment of this Force are squadrons of Republic F-84Es and Gs, and Meteor F.4s, F.8s and N.F.11s. Eight squadrons of aircraft are provided for NATO, and under the infrastructure programme seven airfields have been approved for construction in Denmark. One of these, at Vaerbose, is complete. In June last year a contract for thirty Hawker Hunters (worth over £3 million, including spares) was approved by the Danish Defence Ministry. Other types of aircraft include Meteor T.7s, Chipmunks, Harvards, Oxfords and a few remaining Mustangs. The standard A.O.P. machine is the KZ-10.

DOMINICAN REPUBLIC

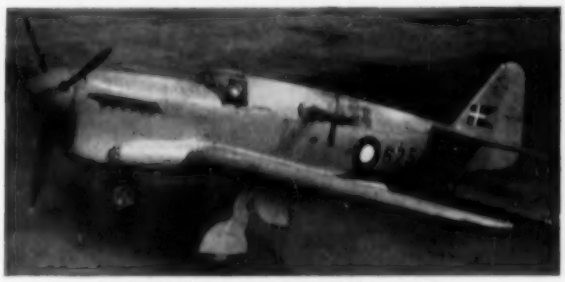
The Dominican Air Force

KNOWN AS *El Cuerpo de Aviacion Militar*, the Dominican Air Force has its main base at General Andrews Airport, Ciudad Trujillo. Formal request has been made to the United States Government for the supply of 25 North American F-86F fighter/

D.H. Chipmunk (Royal Danish A.F.).

(Below) English Electric Canberra B.6 (Ecuadorean A.F.).

Gloster Meteor F.8s (Royal Danish A.F.).



Fairey Firefly target tug (Royal Danish A.F.).

bombers, but for the present, the first-line types are North American P-51 Mustangs, Republic P-47 Thunderbolts, de Havilland Mosquitoes, and Boeing B-17s. Boeing PT-13s and North American AT-6s serve for training, and Consolidated PBY Catalinas for patrol. Standard transport machines are the Curtiss C-46 Commando and Beechcraft C-45, and general purpose types are the Aero Commander, de Havilland Canada Beaver and Cessna. Helicopters are also in service.

ECUADOR

The Ecuadorean Air Force

HEREAFTER CALLED the F.A.E. (signifying *Fuerza Aérea Ecuatoriana*), the Ecuadorean Air Force is headed by a Commanding General, who is either a colonel or general in rank, and a qualified pilot withal. All departments are headed by officers ranking from lieutenant-colonel and all are qualified pilots. Operational elements include fighting, bombing, transport and training units, each with its own central command and staff. There is a Military Flying School from which cadets are transferred to operational units, and a Training Group.

Development of the F.A.E. has been a matter of close concern to the Ecuadorean Government. Fully 90 per cent of the pilots and 40 per cent of the specialists have completed their technical training abroad, mainly in the U.S.A., whence the F.A.E. has always received assistance and co-operation. The F.A.E., too, acknowledges the aid of the Royal Air Force, and at the present time F.A.E. technicians are in Great Britain. Progress in the past three years has been great, as witness the recent acquisition of a number of English Electric Canberra B.6 jet bombers.

The Military Flying School and the various Groups use North American T-6s for training, and the Fighting Group has Republic F-47 Thunderbolts, also for training. The Transport Group has Douglas C-47s and Beechcraft C-45s, which it employs for all types of transport service for the Armed Forces. Embodied in this Group is a squadron of PBY Catalinas, responsible for patrolling the continental coast of Ecuador and the coast of Galapagos Island, which is part of Ecuador, 600 miles out in the Pacific. This patrolling includes the control of fishing.

EGYPT

The Egyptian Air Force

THE EGYPTIAN authorities decline to release any information on the composition and equipment of their Air Force beyond the bare statement that "the latest types of aircraft used are Meteors and Vampires". It can, however, be said that the Meteors are of two marks, 4 and 7, and that the Vampires are F.B.52s. Piston-engined Hawker Fury fighter/bombers, Spitfires, Macchi C.205s and Fiat G.55s have also been supplied, and there is a selection of transport and training aircraft of British, American and Czech types. Last summer, A. Cdre. Soliman, of the E.A.F., said that Egypt was already turning out trainers "similar to the Chipmunk" and was soon to produce a "still-secret jet fighter". Aircraft for the E.A.F., he added, were being constructed with materials imported from outside the Iron Curtain.

THE WORLD'S AIR FORCES...

ETHIOPIA

The Imperial Ethiopian Air Force

DEVELOPED OVER a period of nine years, this Force now consists of a headquarters, at Addis Ababa; a training unit for pilots, navigators, meteorologists, radio operators and technicians, fitters, riggers and armourers; and an attack wing. A photographic section deals with aerial photography and survey, and there is a transport squadron, which achieves a high utilization on internal and international flights.

The main duty of the Force, which is continually expanding, is national defence. Soon, it is hoped, a highly effective force of modern jet fighters will be built up; for the present the following types are in service: Saab 91B Safir (primary pilot-training); Saab B-17 (advanced pilot training); Fairey Firefly Mk 1 (ground attack, dive bombing and training); Stinson L-5 (communications); Cessna Crane (advanced pilot- and crew-training); Douglas DC-3 (transport); and D.H. Dove (transport). The Force is under the command of Brig.-Gen. Chr. Nilsson, K.S.O. 1st cl., R.N.O., Royal Swedish Air Force, and there is a staff of Swedish technicians and instructors. Three British instructors are also on the strength.

FINLAND

The Finnish Air Force

IN accordance with the Peace Treaty signed in Paris in 1947, Finland may not possess aircraft designed primarily as bombers with internal bomb-carrying facilities, nor any guided missiles. The peace-time air force may not consist of more than 60 combat aircraft and 3,000 officers, N.C.O.s and men; in fact, the strength maintained since the Peace Treaty has been considerably less than allowed. Headquarters are at Helsinki, Munkkiniemi. There are wings at Jyväskylä, Pori, and Utti, an air academy at Kaukava, and a depot at Tampere.

The Force is charged with general interception duties and the support of land forces, and provides, in addition, aircraft for survey and ice reconnaissance. Primary trainers are the Swedish-built Valmet Viima and the German Focke-Wulf Stieglitz; advanced trainers are the Valmet Pyry and Vihuri II; the Fokker C.X serves as a target tug; the Bristol Blenheim and Douglas DC-2 for aerial photography; the Beechcraft for liaison duties; and the de Havilland Vampire as a fighter/trainer. It is planned to renew the obsolescent equipment, and on March 23rd the Financial Council of State Finance Committee decided to order four de Havilland Vampire Trainers. It has also been announced that a contract has been signed between Hunting Percival Aircraft, Ltd., and the Finnish Ministry of Agriculture for the supply of two Pembrokes, to be used primarily for survey.

General Officer Commanding is Major General R. Artola.

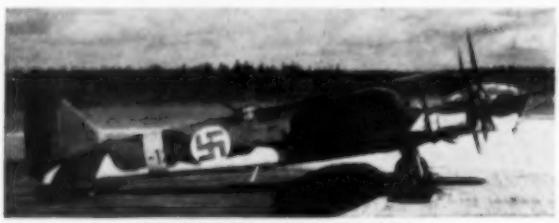
de Havilland Vampire F.B.52 (Egyptian A.F.).

Gloster Meteor F.4s (Egyptian A.F.).

Fairey Firefly 1 (Imperial Ethiopian A.F.).

Saab-17s (Imperial Ethiopian A.F.).

D.H. Vampire F.B.52 (Finnish A.F.).



Bristol Blenheim IV (Finnish A.F.).

Valmet Vihuri (Finnish A.F.).

(Below) Focke-Wulf Stieglitz (Finnish A.F.).

Valmet Pyry (Finnish A.F.).

(Below) Valmet Viima (Finnish A.F.).

French-built D.H. Vampires (French A.F.).

FRANCE

The French Air Force

THE PRESENT French Air Force (*Armée de l'Air*) must be viewed in the light of its immediate past. Though its traditions and history date back to World War 1, the events of World War 2 brought first the dissolution of the Air Force as such, and then the destruction and dispersal of the industry—without which, of course, it could not for long exist. During the occupation of the country many factories were forced to work for Germany, producing a variety of aircraft (mainly transports and liaison types); but these plants were subjected to Allied bombing attacks. By the end of the war, much of what had not been destroyed had been dispersed and hidden to avoid sequestration and bombing.

In 1945 the French Air Force counted only those units which had been formed and equipped within the air force of one or other of the Allied nations, and the aircraft consisted of P-39s, P-47s, Spitfires and Russian Yak-3s. These last were flown by members of the Normandie-Niemen group, formed as one of the first Free French units in Syria and sent to the Russian front. P-38s and P-51s were supplied for reconnaissance, and bomber squadrons with the R.A.F. flew Halifaxes and Marauders. Some French C-47 transport squadrons, also, were formed.

In many areas of the world French units upheld the high traditions of their Service, but after the war the above-mentioned aircraft, together with some German transport and liaison types (production of which was continued after the German collapse) formed the sole basis for the reconstitution of a completely new national air force. Neither could anything be done to remedy this situation until the industry itself could make up five lost years of intensive development and once again turn out the required material. It has taken ten years to do so, and not till last year did the French Air Force achieve once again something of its pre-war stature, both in material and expectations.

It must be remembered that whereas we in this country consider new types as replacements for older ones, the French must look to many new aircraft as the wherewithal for the first formation of certain types of unit. This is particularly true of bombers. There are at the moment no such machines in the French Air Force, and the Vautour will probably be the bomber to be ordered. Some equipment, even recently, has had to be imported from abroad, or supplied under M.D.A.P., particular examples being Vampires, Meteor N.F. 11s and F-84Gs, F-84Fs and T-33s.

The build-up of design and production has been steady, and the Air Force can now boast a complete range of indigenous trainers and transports. Those very-high-performance fighters now in the design stage and flying as prototypes bid fair to equal, if not to out-perform, anything at present in a similar stage of development abroad. In the possibly critical field of the light fighter France has also applied the full measure of her genius for design, and may well gain an unassailable lead in this category of aircraft. Wisely directed, this potential can give to France an Air Force unequalled in quality and power in Europe.

The present *Armée de l'Air*, then, is a force consisting only of tactical, fighter, transport and training units. It is divided into a series of major commands (*Grands Commandements*) whose duties are at the moment two-fold—tactical (*Forces Aériennes Tactiques*) or general operations consisting of transport, fighter defence, artillery or maintenance and engineering. Operating with the air forces engaged in a theatre of operations, and in conjunction with fighter and reconnaissance units, a Tactical Corps (*Corps Tactique*) must attempt to gain air superiority and support troops on the ground, both by offensive operations and by reconnaissance.

Transport Command (*Groupement des Moyens Militaires de Transport Aérien*) maintains, in peace and war, a network of regular services within the French Union for the benefit of the national defence organization and the Air Force. Special transport operations may also be called for. The G.M.M.T.A. is also responsible for the training of airborne troops and, during operations, for air supply and paratroop dropping.

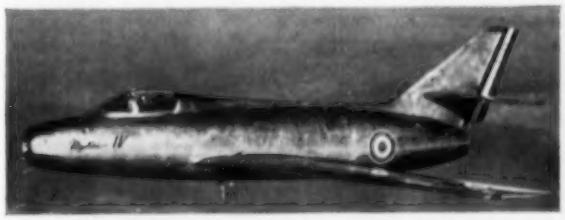
Defence Command (*Défense Aérienne du Territoire*) has the task of gaining and keeping air superiority over national territory by either destroying or neutralizing opposition through fully co-ordinated use of the fighter and anti-aircraft arm.

Defence Command is divided into sub-commands, the first of

Marcel Dassault Ouragan (French A.F.).

Republic F-84 Thunderjet (French A.F.).

S.E. Aquilon (D.H. Sea Venom licence) of the French Navy.



Marcel Dassault Mystère IV prototype (French A.F.).

Nord 1402 Gerfaut prototype (French A.F.).

S.O. 9000 Trident prototype (French A.F.).

S.E.5000 Baroudeur prototype (French A.F.).

S.O.4050 Vautour prototype (French A.F.).

Nord N.C. 856A Norvigie (French A.F.).

Potez 75 prototype (French A.F.).

Nord 2501 Noratlas (French A.F.).

A.A.C.1 (Ju 52/3m) of the French A.F.

Marcel Dassault 311 (French A.F.).

Sipa S.12 (French A.F.).

THE WORLD'S AIR FORCES . . .

which is the *Commandement*, which is responsible for the direction of the D.A.T. forces in a particular territory. Within this territory there will be *Zones de Défense Aérienne* (Z.D.A.) which are the executive commands of the *Commandement* and as such are also responsible for air- sea- and land-rescue operations. Subordinate to the Z.D.A. are the *Secteurs*, equivalent to the Sectors of our own Fighter Command, whose duty it is to direct and co-ordinate the control and reporting organization for both fighter and anti-aircraft units.

The close gun-defence of air bases against medium and low-altitude attacks is the responsibility of the *Artillerie de l'Air*, while the *Génie de l'Air* has the task of preparing, maintaining and, should the need arise, destroying the ground installations necessary for the operational formations.

The smallest operational units of the French Air Force are the squadrons (*escadrilles*), commanded by captains, and these are grouped into wings (*escadrons*, commandant), groups (*escadres*, lieutenant-colonel or colonel), *demi-brigades* (colonel) and finally *brigades*. None of the latter exist as yet, and units other than fighters are defined in *groupes* equivalent to *escadrilles*.

The principal command structure is, however, on a territorial basis. The smallest unit is the *base aérienne*, consisting of an escadre, an administration battalion, a major servicing unit (*parc atelier*) and a radar unit, where applicable. These are under the jurisdiction of the local *Région Aérienne* (commanded by a general) of which there are five, four in France and the fifth in North Africa. They are numbered (1) Dijon, (2) Paris, (3) Bordeaux, (4) Aix-en-Provence and (5) North Africa. Besides these there are the *Commandements de l'Air*, known as A.E.F. (Afrique Equatoriale Française), A.O.F. (Afrique Occidentale Française), the Commandement of Somalia at Djibuti, A.Or.F. in Madagascar (Afrique Orientale Française), Extrême Orient at Saigon and finally the C. de l'A. de la Zone Stratégique d'Afrique Centrale at Colomb Béchar, which is primarily a missile-development command. There is also an independent command which forms part of the NATO organization; called the "1er. CATAC," it has H.Q. at Lahr in the Black Forest, and some of its units are in France.

The French Air Force's equipment includes the following fighters: S.N.C.A.S.E. Mistral (Hispano-Nene-engined Vampire development), Marcel Dassault M.D. 450 Ouragan, Mystère IIC and IVA, and Republic F-84G. There is one *escadre* of RF-84G in the 1er. CATAC. There are now no bombers, for the B-26s in Indo-China went out of service after the cease-fire there; the Vautour can be expected soon, but the first examples of this type will be all-weather fighters. There is a possibility that the Potez 75 ground-attack aircraft will be introduced for police work. The all-weather fighter force is at present composed of one *escadre* of Meteor N.F.11s at Tours, but Vautours should soon begin to supplement these.

The transport groups have a few Ju52s (A.A.C.1) and Languedocs, but rely mainly on C-47 Dakotas and a steadily increasing fleet of Nord 2501 Noratlas, which are giving excellent service. The full order is for about 170 of which almost half have been delivered. The trainer situation is rather more complex, since each basic type has a number of variations according to later modifications and change of power plant. From the basic stage upwards they are the Stampe, M.S. 733 Alcyon, S.I.P.A. 121, M.S. 472-476 Vanneau, Lockheed T-33, and, in the twin-engined class, the Marcel Dassault 315 Flamant series, versions of which have been arranged for several types of training. Artillery spotters include the M.S. 500 Criquet (Storch), the Nord N.C. 856A Norvigie, now coming into service, and the S.O. 1221 Djinn helicopter, a pre-series of ten of which is now well under way, to be followed later by a production batch.

In addition to the above there is a large variety of light and medium communications and transport aircraft which are used throughout the Air Force. Most prolific of these are the Nord 1100 Noralpha and 1203 Norecrin, with a few Nord 1002 Pingouins (Messerschmitt Taifun). The first two types have once more gone into production, but will in due course be replaced by the M.S. 760 Paris. Another replacement in this field will be the Max Holste Broussard, 200 of which have been ordered. Of twin-engined types there are the N.C. 700 series Martinet and the S.O. 94 series Corse.

As for future equipment, the aim is generally to replace any foreign types by French designs, and to introduce new aircraft, such as bombers, of which there are none at the moment. New interceptors in the prototype stage include the S.O. 9000 Trident, the Nord 1402B Gerfaut, the M.D. Mystère IVB1, IVB2 and IVN, and the light fighter and ground attack aircraft known respectively as the Mystère 550 and 26. Another light fighter soon to fly is the Bréguet Taon. Under steady development is the Leduc 022 (at present flying in its earlier air-launched 021 form) which should be capable of Mach 2.

France, being a continental nation with several land frontiers, is

concerned for the safety of expensive and vulnerable airfields. The obvious answer to this problem is to design aircraft which can dispense with anything more complicated than a launching platform, and in this direction one can expect new projects to develop. As already stated, the only bomber in prospect, apart from possible foreign orders, is the Vautour, but in the transport field the Bréguet Deux Ponts and the Hurel Dubois H.D. 32 might be ordered. The trainers are well up to date, but the Fouga C.M. 170R Magister has been ordered and the first machines have already been delivered. The F-84Gs, meanwhile, are now being replaced with F-84Fs.

Principal commanders: Inspector General of the Air Force, Général de l'Armée Martial Valin. Chief of Staff, Général de Corps Aérien Paul Bailly. Commander of the Défense Aérienne du Territoire, Général de Corps Aérien Guillaume Chassin. Commanding the G.M.M.T.A., Général de Brigade Aérienne Pierre Marette. Commanding the Génie de l'Air, Général de Brigade Aérienne Jean Chiari. Director of Air Force Supply, Général Commissaire Raymond Caillat.

French Naval Aviation

THE FRENCH naval air arm, with the official name of *Aéronautique Navale*, has been in existence since the early part of World War 1. Its duties and functions are similar to those of any such arm, namely the protection of the fleet and the provision of a striking arm for it; the protection of harbours; patrol of coastal waters; and provision of anti-submarine protection where possible.

The present constitution of the *Aéronavale*, as it is generally called, suffers from complications in equipment similar to those pertaining in the air force, except that it relies rather more heavily upon American-supplied specialized carrier-borne and land-based patrol aircraft.

Before World War 2 there was one carrier, *Béarn*, and now there are four. They are the *Bois Belleau* and *Lafayette*, both ex-U.S. Navy vessels, and the *Arromanches*, ex-H.M.S. *Colossus*, bought from the British Government. An ex-R.N. escort carrier, (formerly H.M.S. *Biter* and now called *Dixmude*, is used purely as an aircraft transport. Two new carriers are at present being built in France, and these will be equipped with the angled deck, steam catapult and mirror landing aid. The principal shore bases are at Paris, Les Mureaux; Lorient, Lann/Bihoué; Southern France, Hières; Tunisia, Bizerta; Oran, Lartigue; Morocco, Port Lyautay.

The equipment of *Aéronavale* is very varied, but many of the older aircraft are gradually being withdrawn from service as they become unrepairable. The principal fighters are F4U Corsair fighters (some of the last batch produced by Chance Vought), Grumman F6F Hellcats and S.E.-built F.B. and F.A.W. Aquilons (Sea Venoms). Strike aircraft are mainly TBM Avengers, with some SB2C Helldivers. Flying boats include Short Sunderland 5s and 25 Nord 1402 Noroits, with some PBY Cansos and possibly a few Breguet 731s. The main maritime patrol machines are 54 Avro M.R. Lancasters, delivered in 1952, and Lockheed P2V Neptunes, with some Harpoons. A version of the Hurel Dubois H.D.32 is now being prepared for coastal anti-submarine work. The number of helicopters is steadily increasing, main types being the Sikorsky S-55 and Piasecki HUP-2, with Bell 47s for training. Fixed-wing trainers include Stampes, SNJ Harvards, S.O. 94 and 95 Corses and Nord 700 series Martinets, with a number of S.E.-built Vampires. There is a great variety of general-purpose transports and communications types, including Nord 1002 Pingouins, Bloch 161s (also used for air/sea rescue), Beech 17 Expediters, some Ju 52s, some Martinets and S.O. 30 Bretagnes.

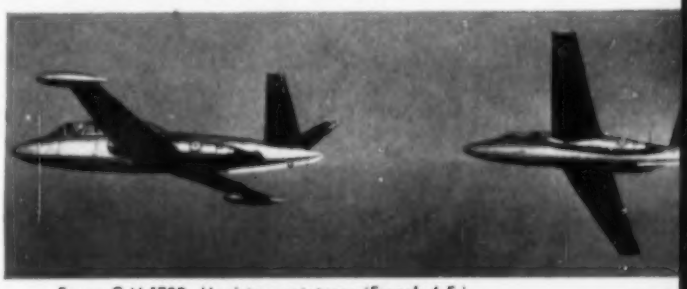
Chief of the Central Service of the *Aéronavale* is Admiral H. J. A. Ruyssen.

GERMANY

The German Air Force

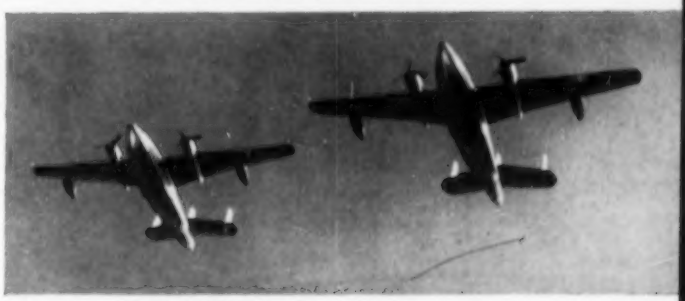
IT HAS been unofficially reported that the German Air Force will be composed of eight day-fighter units of 75 aircraft each, two all-weather fighter units with 36 aircraft each (these might be Northrop F-89s) two reconnaissance units of 54 aircraft each (possibly F-86Ks), two transport units of 45 aircraft each, and six fighter/bomber units of 75 aircraft each (possibly Republic F-84Fs).

Morane Saulnier M.S.475 Vanneau (French A.F.).



Fouga C.M.170R. Magister prototypes (French A.F.).

Lockheed P2V-6 Neptune (French Navy).



Nord 1402 Noroits (French Navy).

Westland WS-55 (French Navy).

Hiller 360s (French A.F.).

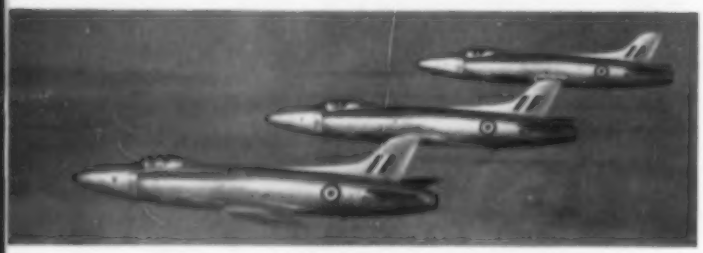
Below, S.O. Djinn prototype.

THE WORLD'S AIR FORCES . . .

BRITAIN

The Royal Air Force

Hawker Hunter F.2s (R.A.F.).



Vickers-Supermarine Swifts (R.A.F.).

Gloster Meteor F.8s (R.A.F.).

D.H. Venom F.B.1 (R.A.F.).

A. W. Meteor N.F.14s (R.A.F.).

D.H. Venom N.F.2 (R.A.F.).

AT VARIOUS times both Britain's army and navy have endeavoured to control their own air services, and in the case of the Royal Navy the effort was successful. Under the title of Naval Aviation the Fleet Air Arm was reconstituted as part of the Navy in 1937, and has since been renamed the Fleet Air Arm. In the 1914-18 war pilots and aircraft were allocated for definite operational duties to the various army corps, but despite the employment of paratroops and the establishment of the Glider Pilot Regiment in the recent war, the army has never had an air service of its own; the Air Observation Post and Light Liaison squadrons which it now has are, in fact, R.A.F. units commanded by Army officers, and their aircraft are flown by Army pilots. It is interesting to speculate whether, with the advent of the helicopter, the Army may not at some future date have its own specialized air arm. Largely because of employment of paratroops by the Germans in the last war, the need was felt for ground troops under the control of the R.A.F. To meet this need the Royal Air Force Regiment was formed in February 1942, the main tasks of the force being the defence of airfields and depots against both ground and low-level air attack.

A.A. Command, which was manned by the Army, has been disbanded and the operation of the ground-to-air guided missiles which replace it has been made the responsibility of the R.A.F. Except for the announcement of trials taking place on the ranges at Woomera in Australia, and at Aberporth in Wales, complete secrecy shrouds operational work with guided missiles. No information is available concerning the formation of any units to perform these duties.

The year 1925 saw the establishment of the Auxiliary Air Force which now, with the prefix Royal, contributes 20 squadrons to Fighter Command. The future of these units is difficult to foretell as it is thought by the authorities that flying supersonic fighters and mastering all the complicated present-day aids to air fighting is a job of which only professional service pilots are capable.

Of the feminine side of the service there is the Women's Royal Air Force, which has now become an integral part of the R.A.F., and Princess Mary's Royal Air Force Nursing Service.

No exact figures of the number of aircraft at present in the Royal Air Force may be disclosed but the Duke of Edinburgh in his Commonwealth and Empire Lecture last December gave 5,000 as the approximate total. Personnel figures shown in the recent Air Estimates Memorandum give a total for 1955 of 254,000, of which about 40,000 are airmen serving on engagements of 12 years or more. At the end of the 1914-18 war, R.A.F. personnel numbered 283,652, with 22,171 aircraft on charge. The peak figures for the 1939-45 war were 1,186,000 and 43,000 respectively. Some 9,200 of the aircraft were operational.

With Her Majesty Queen Elizabeth II at their head, the Royal Air Force, with its Auxiliaries and its Reserves, is controlled by the Air Council, which at present consists of Lord de L'Isle and Dudley, Secretary of State for Air; George Ward, M.P., Parliamentary Under-Secretary of State for Air; Marshal of the Royal Air Force Sir William F. Dickson, Chief of the Air Staff; Air Chief Marshal Sir Francis J. Fogarty, Air Member for Personnel; Air Marshal Sir Donald Hardman, Air Member for Supply and Organization; Air Chief Marshal Sir Ronald Ivelaw-Chapman, Vice-Chief of the Air Staff; Air Marshal T. G. Pike, Deputy Chief of the Air Staff; Air Chief Marshal Sir John W. Baker, Controller of Aircraft, Ministry of Supply; and Sir James H. Barnes, Permanent Under-Secretary of State for Air.

The Department of the Chief of the Air Staff at the Air Ministry is sub-divided as follows: Policy, Operations, Intelligence, Training, Operational Requirements, Signals and R.A.F. Regiment. The Personnel and the Supply and Organization departments are also sectionalized.

The training and operational side of the R.A.F. in the United Kingdom is taken care of by the various commands. Bomber Command, with its headquarters at High Wycombe, Bucks, is commanded by Air Marshal Sir George H. Mills and made up of No. 1 Group and No. 3 Group. Its operational aircraft at the moment are mostly English Electric Canberras (B.2 and B.6) with a few Avro Lincolns employed for minelaying. The Vickers Valiant, the first of the four-jet V-Bombers, is now in squadron service and will be followed by the Avro Vulcan and Handley Page Victor. Bomber Command also employs Canberras of various marks as the equipment of the photographic reconnaissance units which operate from Wyton under its control.

Fighter Command, under its A.O.C-in-C. Air Marshal Sir Dermot A. Boyle, operates three groups, No. 11, 12 and 81. In addition to the Regular fighter units the command operationally controls the 20 Royal Auxiliary Air Force squadrons. No. 81 Group is concerned principally with operational conversion work. As day fighters the command has Hawker Hunter F.1s and F.2s,

Gloster Meteor F.8s (with some Sabres) for the Regular squadrons and de Havilland Vampires and Gloster Meteors in the Auxiliary units. Night fighters include Armstrong Whitworth Meteor N.F.11s and 14s and D.H. Venoms. Gloster Javelin FAW.1s will be entering service this year and the English Electric P.1 will be evaluated as a supersonic intercepter. Some Bristol Sycamore helicopters are kept for search-and-rescue work.

The future of the Supermarine Swift, a few of which were issued to one squadron, remains indeterminate.

Other units coming within the sphere of Fighter Command include the Central Fighter Establishment, at West Raynham, which is devoted to the development and study of fighter tactics, the School of Control and Reporting at Middle Wallop and, operationally, the 28 R.Aux.A.F. Fighter Control and Radar Reporting Units and the Royal Observer Corps. The School of Land/Air Warfare at Old Sarum, where officers of all three services become students, also comes under the administration of Fighter Command, although it is functionally controlled directly by the Air Ministry through the Assistant Chief of the Air Staff (Operations). Finally, within Fighter Command are the Air Observation Post squadrons, which are commanded by Army officers and manned by Army pilots but serviced by R.A.F. personnel. Auster A.O.P. aircraft are used by these units.

Coastal Command, with its two groups, Nos. 18 and 19, has as its A.O.C-in-C. Air Marshal Sir John N. Boothman. The headquarters of Coastal Command are at Northwood, Middlesex. In addition to the two groups mentioned, R.A.F. Gibraltar comes under Coastal's direct control.

The operational squadrons of the command are engaged almost exclusively on maritime reconnaissance and anti-submarine duties. They are equipped with Mk 1 and 2 variants of the Avro Shackleton, with Lockheed Neptunes and with Short Sunderlands; the life of the last-named type is coming to an end after many years of excellent service the world over. A Coastal Command squadron at Aldergrove in Northern Ireland has Handley Page Hastings, which are used daily for long-range meteorological flights over the Atlantic. Short Seamews are on order for anti-submarine work over coastal waters.

Co-ordination in all search-and-rescue work, over both land and sea, is an important responsibility of the Command; and in this connection it is interesting to note that the R.A.F. now has eight mountain rescue units—seven in Great Britain and one in Cyprus. These formations are all manned by volunteers.

Instructional units within Coastal Command are the School of Maritime Reconnaissance, the Air/Sea Warfare Development Unit, and the Maritime Craft Training School at Mount Batten; and the Command also has an interest with the Navy in the Joint Anti-Submarine School at Londonderry in Northern Ireland.

All R.A.F. marine craft units operate under Coastal, which also maintains H.M.S. *Bridport* and H.M.S. *Bridlington*. These two vessels, which are both 600-ton minesweepers of the *Bangor* class, have a variety of functions, including range protection and the putting down and taking up of moorings and targets.

Transport Command, under A.V-M. G. R. Beamish, has no groups, but operates its squadrons directly. Its name is an exact statement of its role—to provide transport by air for all three Services. It operates its Handley Page Hastings aircraft over world-wide routes equal to those flown by major airlines and has to take in its stride such other duties as ferrying aircraft overseas, dropping paratroops and bringing flood and famine relief.

Vickers Valettas and Avro Yorks are operated in addition to the Hastings, and Blackburn Beverleys will soon be at the disposal of the Command. The Comet 2, also, will shortly form part of its air equipment; the Comets are likely to be used mainly as a high-speed link between Great Britain and Woomera in Australia.

Other units which come under Transport Command's authority are No. 1 Parachute Training School at Abingdon, the Transport Command Development Flight, the Examining Unit and Modification Centre and the Ferry Training Unit. The Queen's Flight is an independent unit, but it is housed at Benson, Oxfordshire, which is one of Transport Command's stations.

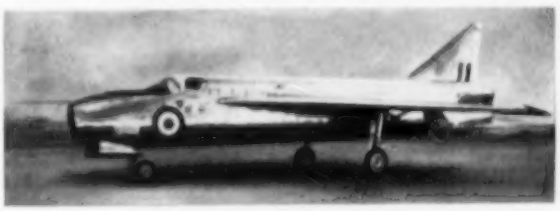
The R.A.F. staging posts used on its world routes are not administered by Transport Command but the Command determines the posts' suitability for their purpose.

Flying Training Command, of which Air Marshal Sir Lawrence F. Pendred is A.O.C-in-C., is composed of Nos. 21, 23 and 25 Groups. Its function is the training of aircrew, and for this purpose it maintains an Initial Training School, an Air Navigation School, an Air Signallers' School and 11 Flying Training Schools. The aircraft types principally used are Percival Provost, D.H. Vampire and Gloster Meteor 7, with Vickers-Armstrongs Varsities for navigational training.

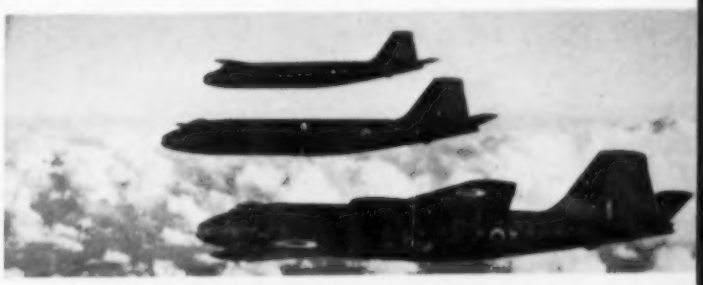
A number of important units are administered by the Command from its H.Q. at Shinfield Park, Reading, Berkshire. These include R.A.F. College Cranwell (where D.H. Chipmunks and Boulton Paul Balliols are used, because of airfield limitation), the R.A.F. Flying College at Manby, Central Flying School at Little Rissington and South Cerney, Central Navigation and Control School at Shawbury, and the School of Instructional

Gloster Javelin FAW.1 (prototypes and early production) (R.A.F.).

de Havilland Hornet F.3s (R.A.F.).



English Electric P.1 prototype (R.A.F.).



English Electric Canberra B.6s (R.A.F.).

English Electric Canberra B.8 prototype (R.A.F.).

Vickers-Armstrongs Valiant B.1 (R.A.F.).

Avro Vulcan B.1 prototype (R.A.F.).

Handley Page Victor B.1 prototype (R.A.F.).

Gloster Meteor F.R.9 and P.R.10 (R.A.F.) with F-84 (Belgian A.F.).

English Electric Canberra P.R.7 (R.A.F.).

(Below) Avro Shackleton M.R.2 (R.A.F.).

THE WORLD'S AIR FORCES . . .

Technique, which is based at Hullavington.

Cranwell is the college to which officer students go who intend to make the R.A.F. their life career. Both General Duties and Secretarial and Equipment Branches are catered for. Having graduated at Cranwell, a General Duties cadet leaves the College already in possession of his Wings.

The Flying College has a variety of functions and was, originally, a combination of the Empire Air Armament School, the Empire Air Navigation School and the Empire Flying School. At the conclusion of each course the students make a series of world-wide flights, some going to polar regions, others to the United States of America and others to the Far East.

Central Flying School—which was the first unit of the Royal Flying Corps—is perhaps the most famous Service unit in the world. Pilots from a great many nations have attended it to obtain their instructors' tickets. In addition to its function of instructing instructors, C.F.S. also operates an Examining Wing which visits every flying unit of the R.A.F., no matter where in the world it may be stationed. The objects of the Wing are to check standards of flying and to evolve new pilot techniques where necessary. During its travels the Wing also visits, by invitation, a number of other air forces.

The Central Navigation and Control School at Shawbury gives navigators specialized post-graduate training and also instructs flying-control officers in their duties.

As would be expected, both Central Flying School and the Flying College operate a variety of aircraft; C.F.S. has one of almost every type in service with the R.A.F.

Technical Training Command, of which Air Marshal Sir Victor E. Groom is A.O.C-in-C., is responsible for all ground training; its units include the R.A.F. Technical College at Henlow and Debden. The command operates No. 22, 24 and 27 Groups. H.Q. are at Brampton, Huntingdon.

It has a greater variety of units than any other command. Of particular importance are the two establishments—No. 1 School of Technical Training at Halton and No. 1 School of Radio at Locking—where apprentices are trained for their selected trades. Another main unit is No. 2 School of Technical Training at Cosford, for boy entrants to the Services.

Other units include the School of Administration; the Women's Royal Air Force Depot at Hawkinge; two cookery schools; the School of Physical Training; the School of Training Organization and Method; the School of Education, for training education officers; the School of Firefighting and Rescue; the School of Photography; the Chaplains' School; the R.A.F. Regiment's L.A.A. Gunnery School at Watchet; radio schools at Yatesbury and Compton Bassett; and the Police Depot at Netheravon. Technical Training Command also administers the R.A.F. Regiment Depot at Catterick.

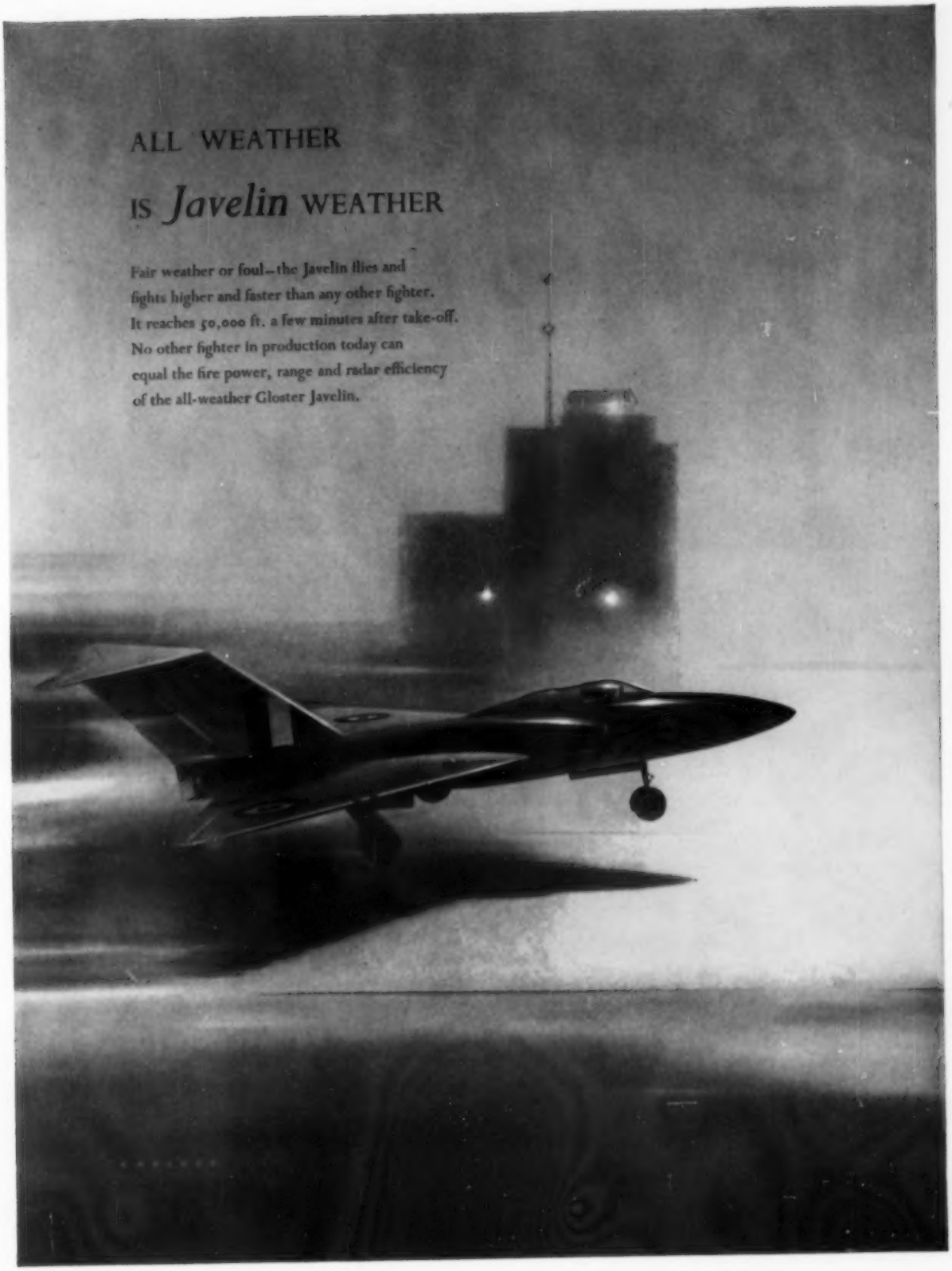
Maintenance Command, with headquarters at Andover, operates Nos. 40, 41, 42 and 43 Groups. The present A.O.C-in-C. is Air Marshal L. G. Harvey. Work of the Command is sectionalized in the following manner: No. 40 Group is responsible for all ground and aircraft equipment; No. 41 Group is devoted almost entirely to aircraft storage; No. 42 Group has on charge all ammunition and other explosives and fuel; and No. 43 Group is concerned exclusively with repair and salvage. For administration only, the Staff College at Andover comes under Maintenance Command.

Home Command, under Air Marshal Sir Harold T. Lydford, operates through six regional groups: No. 61 (Eastern), No. 62 (Southern), No. 63 (Western and Welsh), No. 64 (Northern), No. 66 (Scottish) and No. 67 (Northern Ireland).

The chief duties of the Command (whose H.Q. are at White Waltham, near Maidenhead) are recruiting and the administration of all reserves, which includes the University Air Squadrons and the Royal Auxiliary Air Force, although, as was pointed out in an earlier section, a proportion of the latter comes under the operational control of Fighter Command. The R.Aux.A.F. is composed of 20 fighter squadrons, 28 fighter control and radar reporting units, five A.O.P. squadrons and 12 R.Aux.A.F. Regiment squadrons. Home Command is directly responsible for the Air Training Corps and the R.A.F. sections of the Combined Cadet Force.

No. 62 (Southern) Group administers the Staff College at Andover, which comes physically within the Group's area but, apart from providing necessities, has no responsibility for the work of the college. In a like manner, No. 63 (Western and Welsh) Group looks after the R.A.F. element at the Ministry of Supply's guided weapon testing ground at Aberporth. The medical services, too, are directed by the Air Ministry but administered by Home Command. These units include all the hospitals, the Institute of Aviation Medicine at Farnborough and the Central Medical Establishment.

Small units within the Command include the Record Office at Innsworth, Gloucester, and the Movements School, which teaches its students how to move personnel and material by air, land and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sea transport. The only aircraft the command has on charge are the D.H. Chipmunks flown by the University Air Squadrons.

No. 90 Group at Medmenham, Bucks, commanded by A.V-M. J. G. W. Weston, is entirely devoted to signals and operates independently, not being attached to any command; it is, in fact, a Group with Command status. It controls the main signals centre at Stanbridge and the Central Signals Establishment at Watton.

Overseas the R.A.F. maintains three separate air forces: Middle East Air Force, Far East Air Force and 2nd T.A.F. in Germany.

The M.E.A.F., of which Air Marshal Sir Claude B. R. Pelly is C-in-C., at present has its headquarters divided between Nicosia in Cyprus and Ismailia in Egypt, and this will remain so until the Anglo-Egyptian treaties concerning the Canal Zone are completely implemented. Eventually the H.Q. will be at Episkopi in South Cyprus. The force embraces a wide area and operates through H.Q. British Forces Aden, Air H.Q. Iraq, No. 205 Group and R.A.F. Cyprus. Until recently No. 206 Group was included, but this it now defunct; and Air H.Q. Malta, which is in the force's administrative area, today forms part of the NATO organization and is directly controlled by the Air Ministry.

H.Q. British Forces Aden has wide responsibilities. The A.O.C. commands all British forces allocated to the area, and the R.A.F. element operating from Eastleigh against the Mau Mau in Kenya also comes within its ambit, as also do the three staging posts at Riyan, Salalah and Masirah, which form an alternative route to India to that flown through Habbaniya. The Khartoum staging post—where also is the M.o.S. Tropical Trials Unit—is administered by Aden, but it is possible that the implementation of the Anglo-Sudan-Egyptian treaties may mean the eventual loss of this base.

In Aden itself there is No. 8 Squadron, which has been there since the late 1920s, a Wing of the R.A.F. Regiment, and the Aden Levies.

The R.A.F. in Iraq are also in process of handing over air bases in pursuance of the terms of the Anglo-Iraqi agreement. The agreement allows, however, for the R.A.F. to enjoy certain flying facilities, including the right for squadrons to visit Iraq at all times for training purposes.

Aircraft operated by M.E.A.F. include D.H. Vampires and Venoms, Meteors, Valettas, and Hunting Percival Pembrokes. A few 3-seat Prentices also are employed for communications flying and the operations against the Mau Mau are flown by Avro Lincolns and North American Harvards.

Far East Air Force, commanded by Air Marshal Sir A. Clifford Sanderson, covers an enormous area. From its main headquarters at Changi, Singapore, it operates through Air H.Q. Hong Kong, Air H.Q. Singapore, Air H.Q. Ceylon and Air H.Q. Malaya.

F.E.A.F.'s main occupation at the present time is to keep up a continuous attack against the bandits in the Malayan jungle. For this purpose a variety of aircraft are employed, including D.H. Venoms and Hornets, Short Sunderlands, Scottish Aviation Pioneers, and Westland-Sikorsky Dragonfly and Bristol Sycamore helicopters, with Vickers Valettas for transport and supply. A few D.H. Mosquitoes are used in the Malaya Training Centre and the A.O.P. and Light Liaison Flights employ Austers. There are, at the moment, some Canberras in Malaya—ostensibly to operate against the bandits but more likely to undergo prolonged trials in the local high temperatures and humidities.

Air H.Q. Ceylon is a staging post only, and Hong Kong employs D.H. Vampires and Hornets for its own defence and is also a staging post on the route from Singapore to Okinawa and Japan. Air H.Q. Singapore at Seletar operates the Far East Transport Wing with Valettas, Sunderlands for reconnaissance and some P.R. Mosquitoes.

In view of the present political situation, 2nd T.A.F. in Germany is perhaps the most important of all our overseas air forces. It is commanded by Air Marshal Sir Harry Broadhurst. The force is composed of Nos. 2 and 83 Groups, two groups which, mainly in their present role, had such a splendid war record. The squadrons are equipped with D.H. Venoms, North American Sabres and both F.R. and P.R. versions of the Gloster Meteor. There are also a few Canberras and an A.O.P. squadron equipped with Austers. As would be expected in a force based on advanced airfields there is a large element of the R.A.F. Regiment for defence against ground or low-level air attack.

The foregoing represents the R.A.F. very nearly in its entirety, but there are small R.A.F. elements in the various Allied Air Forces which make up the NATO air force, and there are air attachés in many of the world's capitals. There is also a British Joint Services Mission permanently domiciled in the U.S.A.

The Fleet Air Arm

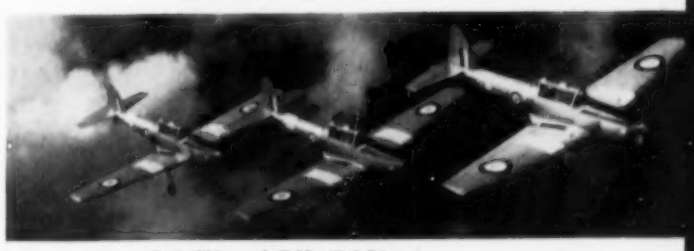
AIR AFFAIRS of the Royal Navy are the special province of the Fifth Sea Lord, Rear-Admiral A. N. C. Bingley, with, in some part, a dual interest by the Third Sea Lord, Admiral Sir Ralph A. B. Edwards, whose special responsibility is supply. Four directorates at the Admiralty are concerned: those of the Director

Short Seamew A.S.1 prototype (R.A.F. and R.N.).

Scottish Aviation Prestwick Pioneer C.C.1 (R.A.F.).

Short Sunderland 5 (R.A.F.).

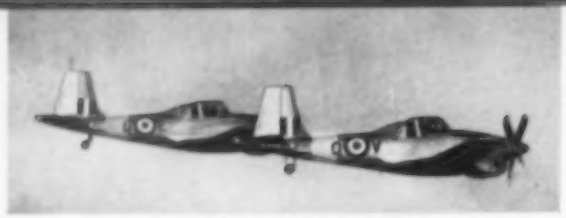
Auster A.O.P.9s (R.A.F.).



D.H. Chipmunk T.10s (R.A.F.).

(Below) Hunting Percival Provost T.1s (R.A.F.).

THE WORLD'S AIR FORCES . . .



Boulton Paul Balliol T.2s (R.A.F.).

Vickers-Armstrongs Valetta C.1 (R.A.F.).

English Electric Canberra T.4s (R.A.F.).

Hunting Percival Jet Provost T.1 (R.A.F.).

Vickers-Armstrongs Varsity T.1 (R.A.F.).

(Below) Handley Page Hastings C.2s (R.A.F.).

of Naval Air Warfare (and Adviser on Aircraft Accidents), Capt. F. H. E. Hopkins; Director of Naval Air Organization and Training, Capt. B. E. W. Logan; Director of Air Equipment and Naval Photography, Capt. A. C. G. Ermen; and the Director of Aircraft Maintenance and Repair, Rear-Admiral J. D. N. Ham.

In the sea commands, the Home Fleet (Admiral Sir Michael M. Denny) has no air responsibility at the moment. If the need arose for carriers to join the Home Fleet the responsibility would be delegated to Flag Officer Aircraft Carriers, Rear Admiral A. R. Pedder, who is now with the Mediterannean Fleet, the C-in-C. of which is Admiral Sir Guy Grantham.

At present H.M.S. *Centaur* is the only British carrier in the Mediterranean, but at various intervals, beginning shortly, she will be joined by *Eagle*, *Albion* and *Ark Royal*, the four ships remaining together until the end of the year.

Responsible to Flag Officer Second-in-Command Mediterranean Fleet, the Captain (Air) Mediterranean administers the Naval air station at Hal Far, Malta. This is the airfield from which No 845 Anti-Submarine Squadron operates its Westland-Sikorsky WS-55 Whirlwind helicopters. It is also the home of the Fleet Requirements Unit—No. 728 Squadron—which has on charge Gloster Meteors, Short Sturgeons and D.H. Sea Hornets. Hal Far is extensively used by operational squadrons disembarking from carriers to perform various forms of training. The Royal Navy also has lodger rights at the nearby R.A.F. airfield at Ta' Kali, for use when required.

The Far East Fleet (Vice-Admiral A. K. Scott-Moncrieff) at present has no carriers and the only operational Naval aircraft in the area are the S-55s of No. 848 Squadron, which operate under R.A.F. operational command in the forward areas of Malaya. An air base is kept open at Sembawang, and here there are workshops and storage of reserve aircraft.

Under Flag Officer Air (Home), Rear Admiral Caspar John, whose appointment is quite independent of the Home Fleet, there are three further senior appointments. These are Flag Officer Ground Training, Rear-Admiral R. L. Fisher, in charge of technical training; Flag Officer Flying Training, Rear-Admiral G. Willoughby, whose responsibilities are flying training and the training side of the work done on the Trials and Training Carrier, H.M.S. *Bulwark* (the trials side is a direct responsibility of Flag Officer Air, Home); and Rear-Admiral Reserve Aircraft, Rear-Admiral L. E. Rebbeck, whose duties are those denoted in the title of his appointment.

Under the administrative authority of Flag Officer Ground Training there are six Naval air stations and the R.N. barracks at Lee-on-Solent. It should be explained that, although a station may be under the administrative authority of one Flag Officer, it may house units responsible to another Flag Officer or direct to the Admiralty. The barracks, as well as being the headquarters of F.O.G.T., accommodate a drafting office, transit depot, release centre, welfare section, M.T. pool, the Second Admiralty Interview Board, the Naval Interview Board, the Central Air Medical Board, a writers' course and a mass radiographic unit.

At Lee-on-Solent (H.M.S. *Daedalus*), one of the oldest and best known R.N. Air Stations, is the Junior Officer's Air Course, at which all young officers are given air experience and deck landings in Sea Balliols of No. 781 Squadron. Lee also houses a torpedo section, the Aircraft Accident Investigation Unit, a group weather centre and the Fleetlands Flight Test Section.

Arbroath (H.M.S. *Condor*) is devoted almost entirely to technical training. In addition to the Aircraft Artificers' Training Establishment, there are conversion courses for Commonwealth ratings, aircraft mechanics training, petty officer airmen fitters A, E and O training and an aircraft inspection and survey party. It is also the H.Q. of Rear-Admiral Reserve Aircraft. Bramcote (H.M.S. *Gamecock*) handles the Part 1 of new entry and Part 2 airmanship training of all Naval airmen, together with Part 2 technical training of Naval air mechanics A and E. It also has the Home Air Command Instructional Technique School, and it is the home of Nos. 1833 and 1834 R.N.V.R. Squadrons, which form the Midland Air Division.

Gosport (H.M.S. *Siskin*) also has a variety of units: the School of Aircraft Handling; No. 705 Squadron, which is the helicopter fleet requirements unit and training unit combined; the R.N. Glider Unit; the Safety and Survival Training School; the R.N. Air Medical School; and the Flight Deck Machinery Trials and Training Unit. There are also an aircraft torpedo development unit of the M.o.S., and radio installation and maintenance development units.

Worthy Down (H.M.S. *Ariel*) is devoted to electrical and radar training. The Naval Air Electrical School is there and provides air electrical and air radio training of officers and qualifying, advancement and conversion courses for ratings. There are also two aircraft transport and salvage units, an equipment and trials section, an operational research section range and an anti-submarine mortar range.

St. Merryn (H.M.S. *Curlew*) is in process of closing down.

Fairey Gannet A.S.1s (R.N.).

The School of Aircraft Maintenance will go to Lee-on-Solent, the Air Ordnance School to Bramcote and the remaining training courses probably to Yeovilton.

Under Flag Officer Flying Training are six stations. Yeovilton (H.M.S. *Heron*) houses the headquarters of F.O.F.T., the Naval Air Maintenance Examination Board and the H.Q. section of the Carrier-Borne Ground Liaison Group.

Culdrose (H.M.S. *Seahawk*) has the Observer and Air Signal School with its attendant Nos. 750 and 796 Squadrons, the Airborne Early Warning Evaluation and Training Unit (with No. 849 Squadron to do its flying) and No. 765 Squadron, which is the piston-engine pilot pool. Culdrose also has the Intelligence and Recognition Centre, a Link Trainer Instructors' Course and a group weather centre. There is accommodation for front-line squadrons.

Lossiemouth (H.M.S. *Fulmar*) has the Naval Air Fighter School, the flying side of which consists of Nos. 736 and 738 Squadrons. There is an Operational Flying School for jet training, and four ranges are available. Front-line squadrons use the station when disembarked.

Eglinton (H.M.S. *Gannet*). This appropriately named station in Northern Ireland is devoted entirely to anti-submarine work, the Naval Air A/S School stationed there being attended by Nos. 719 and 737 Squadrons.

Ford (H.M.S. *Peregrine*) is the home of No. 703 (Service Trials Unit) Squadron, No. 771 (Fleet Requirements Unit) Squadron and No. 764, which is the jet pilot pool. In addition there are the R.N. School of Photography and the two R.N.V.R. air squadrons, Nos. 1840 and 1842, which form the Channel Air Division. Strike squadrons are based here when disembarked.

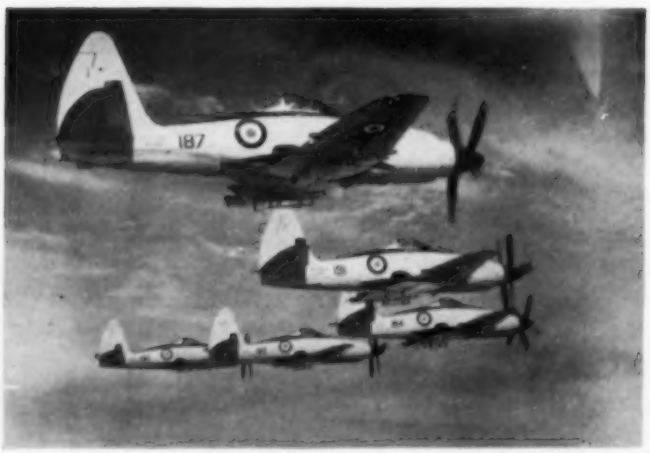
Brawdy (H.M.S. *Goldcrest*) has armament training ranges and is entirely devoted to accommodating disembarked or working-up front-line squadrons.

Six stations also come under the authority of Rear-Admiral Reserve Aircraft and three of these have civilian-manned R.N. Aircraft Yards. At Abbotsinch (H.M.S. *Sanderling*) there is a group weather centre and Nos. 1830 and 1843, R.N.V.R. Squadrons which form the Scottish Air Division. No. 602 (City of Glasgow) Squadron R.Aux.A.F. is temporarily stationed there. Stretton (H.M.S. *Blackcap*) houses the Northern Air Division—Nos. 1831 and 1841, R.N.V.R., Squadrons, an engine holding unit and a mobile aircraft repair unit.

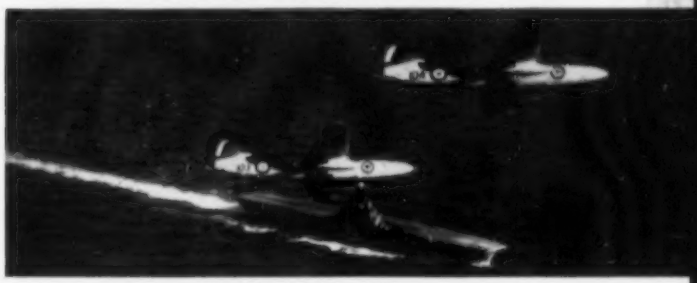
Nos. 1832, 1834, 1835 and 1836 Squadrons forming the R.N.V.R. Channel Air Division are based on the R.A.F. station at Benson, Oxon.

Aircraft types in use with the Fleet Air Arm are:—Training: Boulton Paul Sea Balliol, D.H. Vampire T.22 and Fairey Gannet. Front Line: Hawker Sea Hawk, D.H. Sea Venom, Westland Wyvern and Fairey Gannet. A re-equipment programme allows for the Supermarine N.113 as a Sea Hawk replacement and the D.H. 110 to take the place of the Sea Venoms.

Westland Wyvern S.4s (R.N.).

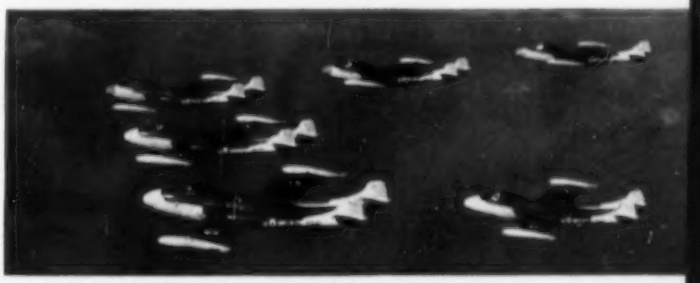


Blackburn and General Beverley C.1 (R.A.F.).



Hawker Sea Hawk F.B.3s (R.N.).

Vickers-Supermarine Attackers (R.N.).



de Havilland Sea Venom FAW.21s (R.N.).

de Havilland D.H.110 prototype (R.N.).

Supermarine 525 (N.113 prototype) (R.N.).

(Below) Westland-Sikorsky Dragonfly (R.N.).

Folland Midge, prototype of Gnat, in which I.A.F. is interested.

Douglas C-47 Dakota (I.A.F.).

THE WORLD'S AIR FORCES . . .

GREECE

The Royal Hellenic Air Force

REPUBLIC F-84 Thunderjets and North American F-86 Sabres (the latter Canadair-built machines formerly in service with the R.C.A.F.) are the latest first-line equipment in this Air Force. The Lockheed T-33 is the standard jet trainer. Curtiss Helldivers are still in use, as are Spitfires, Fairchild Cornells, Douglas Dakotas, Airspeed Oxfords and Avro Ansons. Seven tactical air squadrons have been assigned to NATO and there are five NATO-built airfields in Greece itself. Personnel strength is about 12,000. Very high utilization is being achieved with the new jet fighters.

GUATEMALA

The Guatemalan Air Force

THIS FORCE—the *Fuerza Aérea de Guatemala*—is equipped with American training and transport aircraft, specifically Boeing PT-17s, Vultee BT-13s, North American AT-6s, Beechcraft AT-11s and Douglas C-47s.

HAITI

The Haitian Air Corps

AERIAL PATROL of Haitian territory and adjacent waters; the transport of mail, of members of the Haitian Army and V.I.P.s; the care of airfields throughout the territory; passenger transport; and any additional mission as assigned by the President of the Republic or the Chief of Staff of the Army—all these tasks fall to the lot of the Haitian Air Corps. The commanding officer has three assistant commandants, for operations, supply and maintenance, and administration and personnel. Strength is one composite squadron, composed of North American P-51 Mustang combat aircraft, Fairchild PT-19, Vultee BT-13, North American T-6 and Beechcraft T-11 trainers, and Beechcraft C-45, Douglas C-47 and Boeing S-307 transports.

Principal commanders: Commandant, Lt-Col. G. Edouard Roy; Assistant Commandant for Operations, Capt. Albert Maignan; Assistant Commandant for Supply and Maintenance, Capt. Yvon Boyer; Assistant Commandant for Administration and Personnel, Lt. Joseph L. Jeannot.

Westland-Sikorsky S-55 (I.A.F.).

Hindustan HT-2 (I.A.F.).

Short Sealand amphibian (Indian Navy).

HONDURAS

The Honduras Military Air Arm

NO OFFICIAL information concerning this Air Arm is forthcoming, although some years ago it was known to be equipped with American aircraft, including Lockheed Lightnings, Bell Kingcobras, Douglas Dakotas, Beechcraft C-45s, North American AT-6s, Vultee BT-13s, Boeing PT-13s and PT-17s, and Beechcraft AT-11s.

HUNGARY

The Hungarian Air Force

AMONG THE miscellany of Russian, Czech and German aircraft operated by this Force may be some Yak-23 jet fighters.

INDIA

The Indian Air Force

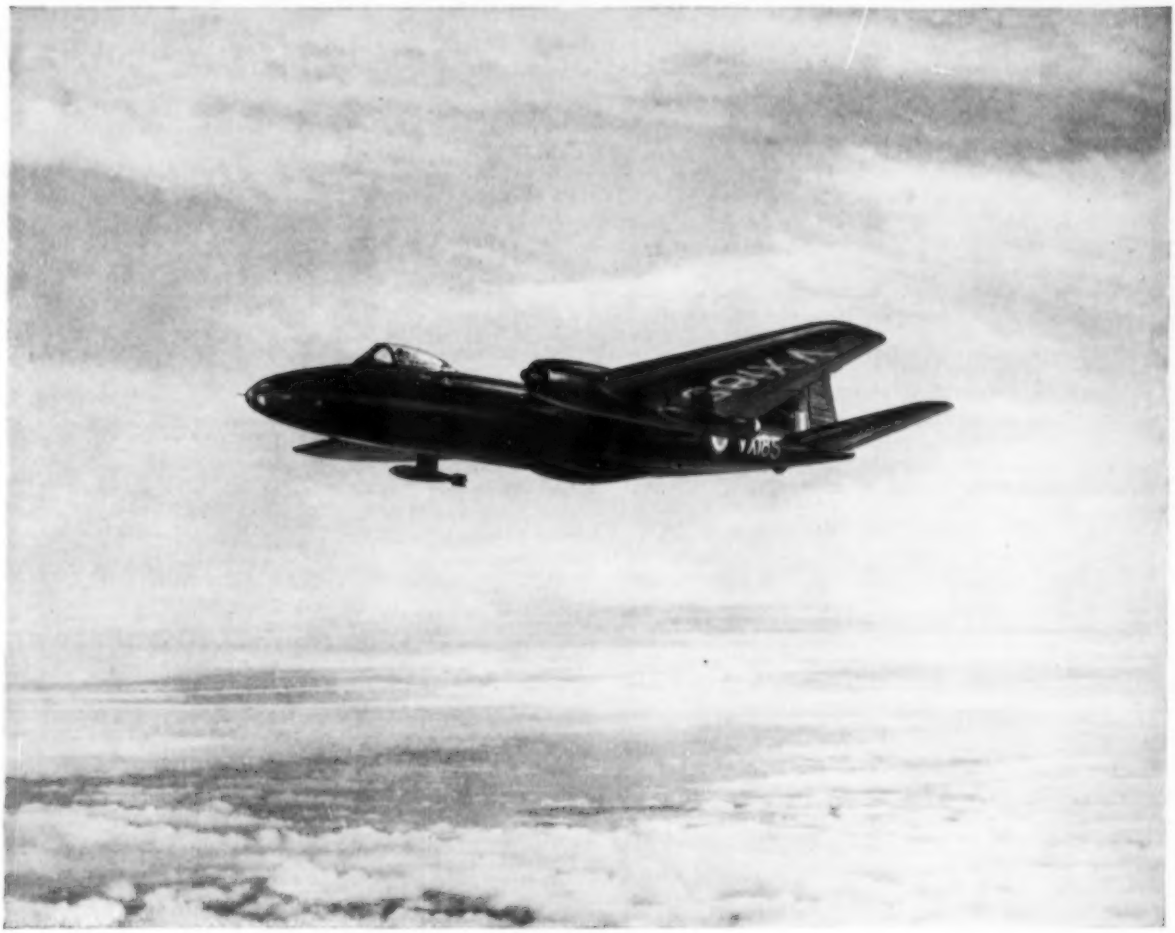
SINCE THE Indian Air Force came into existence in 1933 great advances have been made in equipment and general efficiency. Main events of the past two years may be recapitulated as: 1953—delivery of Vampire Night Fighters by I.A.F. pilots; first batch of Burmese airmen trained by I.A.F. as technicians passes out; air reconnaissance of the eastern coast in search of marooned fishermen; seed-sowing over the Rajputana desert; first Dassault Ouragan jet aircraft flown from France by I.A.F. pilots; flight over Mount Everest. 1954—First flight of Fairchild C-119 transports flown from America by I.A.F. crews; Air Marshal S. Mukerjee takes over as Chief of the Air Staff and Commander-in-Chief; nearly 100 aircraft take part in fire-power demonstration at Tilpat to celebrate 21st anniversary of I.A.F.; prototype of anti-g valve of original design produced by one of I.A.F.'s aero medical research centres; I.A.F. helicopters fly to the rescue of villagers marooned in the Jamuna river. In the I.A.F. the 71 Ouragans, which were purchased at a price of about £50,000 each, are known as Toofanis. They may eventually be supplemented or succeeded by Folland Gnats, and there is a distinct possibility that English Electric Canberras may be ordered. Service equipment includes Liberators for reconnaissance and bombing, C-119Gs for freighting and troop-carrying, in addition to Dakotas. Vampire trainers and Hindustan HT-2s are numbered among the trainers, and Auster A.O.P.9s are being acquired. Sikorsky S-55s have been operating for some time, and on order are two V.I.P. Viscounts, for the use of the President and members of the Government. These aircraft will form part of the I.A.F. communications squadron of the I.A.F., and will be stationed at Palam, near Delhi.

Principal commanders: C.A.S. and C-in-C., Air Marshal S. Mukerjee; D.C.A.S., A.V-M. A. M. Engineer; A.O.C., Training Command, A. Cdre. S. N. Goyal; A.O.C., Operational Command, A. Cdre. D. A. R. Nanda; Air Officer-in-Charge, Technical and Equipment Services, A. Cdre. R. H. D. Singh; Air Officer-in-Charge, Personnel and Organization, A. Cdre. Arjan Singh; O.C., Maintenance Command, G/C. Harjinder Singh.

Indian Navy

AVIATION IN the Indian Navy is at present confined to a Fleet Requirements Unit equipped with Short Sealand amphibians and Fairey Firefly target tugs, operating from the Indian Naval Air Station at Cochin.

Republic F-84 Thunderjets (Royal Hellenic A.F.).



Canberra B 8 'Night Intruder'

The Canberra B 8 is the most versatile of the Canberra series. It can readily be converted to perform a number of rôles, including night intrusion, high altitude bombing and target marking. In its Night Intruder rôle it carries underwing armament and forward-firing cannon in the bomb bay. The offset fighter-type canopy gives the pilot a superb all-round view and the redesigned navigator's compartment provides better vision and a wider range of navigational aids.

'ENGLISH ELECTRIC'
Canberra
ROLLS-ROYCE AVON JET ENGINES

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THE WORLD'S MILITARY AIRCRAFT 1955

("Flight" copyright data tables)

Country Manufacturer and Type (1)	Main Duties (2)	Crew (3)	Span (ft) (4)	Power Units No. type and total h.p. or lb thrust (5)	All-up weight (lb) (6)	Typical Service load (7)	Max. Speed (m.p.h.) (8)	Remarks (9)
ARGENTINA								
I.Ae. 22	T	2	41	1 El Gaucho, 450	4,994	Can be 2f 0.30in + 4r.	180	I.P.: 400+ delivered, some with A.S. Cheetah.
24 Calquin	A, D	2	53	2 P. and W. R-1830, 2,100	15,793	4f 20mm, 1,650 lb int.	280	O.P.: 100+. Based on D.H. Mosquito.
31 Colibri	T	2	34	1 Cirrus Major 3, 155	2,015	—	146	I.P.: Enclosed tandem cockpits.
33 Pulqui II	F, D	1	35	1 Nene 2, *5,000*	13,000	4f 20mm	650	Pr. (2 Pr. lost, devt. continuing. Also I.Ae.37 Pulqui III delta).
35	Misc.	2-5	64	2 El Indio, 1,300	12,566	Various	220	I.P.: trspt., trainer, ambulance, survey, etc.
AUSTRALIA								
C.A.—27 Sabre	F, B, D	1	37	1 C.A.C. Avon 20, *8,000*	17,000	2f 30mm, 4,000 lb ext.	700s	I.P.: Deliveries throughout 1955.
C.A.—22 Winjeel	T	2	39	1 P. and W. R-985, 455	4,235	—	187	I.P.: No. 31 onwards has C.A.C. Cicada engine.
BELGIUM								
Stampe S.V.4	T	2	27	1 Renault 4, 140	1,710	—	127	O.P.: Built *Belgium* (48) and 700 in *France* 1946-51 (4C).
CANADA								
Avro								
CF-100 Mk 4	F, AW	2	52	2 Orenda 11, *15,000*	40,000	104s.r. + 8f 0.50in. RFC.	660s	I.P.: Most of 600 now delivered.
CF-105	F, AW	2	n.a.	2 Super Orenda, *40,000†*	60,000	Will include g.w.	M = 1.5+	Pr.: to fly 1958; delta.
Canadair								
CL-28 Britannia	P, AS	10	142	4 Wright T.C., 14,800	150,000	Search and strike eqpt., various	350	I.P.: Unpressurized. Deliveries to R.C.A.F. 1958-61.
Sabre 6	F, B, D	1	37	1 Orenda 14, *8,000*	16,000	6f 0.50in + 4,000 lb ext.	690s	I.P.: 300+ delivered. O.P.: 347-powered Sabre (800, 370 G.B., Can., Grc., Tur.).
C-54GM	Transport	3-5	118	4 Merlin 620, 6,920	82,300	Up to 56 seats or 17,000 lb.	335	O.P.: 24 built 1947-9 for R.C.A.F.
D.H.C.1 Chipmunk	T	2	34	1 Gipsy Major 1c, 140	1,900	—	140	O.P.: 1,000 built, most in G.B.: Bel., Bur., Can., Cey., Col., Den., Egy., Eir., In., Indon., Irq., Jor., Leb., N.Z., Sy., Th., Ur.
D.H.C.2 Beaver	Transport	1-2	48	1 P. and W. R-985, 450	4,820	Up to 7 seats	164	I.P.: 700 built; 300+ U.S.A.F. and Army; also Chile, Col., S.Kor.
D.H.C.3 Otter	Transport	1-2	58	1 P. and W. R-1340, 600	7,600	Up to 17 seats	160	I.P.: 90 for U.S. Army; also Can., Col., Nor.
CZECHOSLOVAKIA								
Zlin 26 Trener	T	2	34	1 Walter, 105	1,664	—	130	I.P.: Enclosed tandem cockpits; all-metal dev't is Zlin 126.
DENMARK								
S.A.I. KZ-II-T	T	2	34	1 Gipsy Major 10, 145	1,874	—	146	O.P.: 100+ with D.A.F. and Navy.
KZ-X-I	A.O.P.	2	31	1 Cont. C-145, 145	1,896	Army radio, etc.	130	O.P.: 12 with D. Army; Mk II is improved.
FINLAND								
Vihuri VH-2	T	2	33	1 Mercury 8, 820	6,345	Can have light armament	268	I.P.: Nearly all of 50 ordered now in service.
FRANCE								
Marcel Dassault								
Ouragan	F, B, D	1	40	1 H-S Nene 104B, *5,000*	13,574	4f 20mm, 2,200 lb ext.	584	O.P.: 350 built, 71 for In. (named Toofani).
Mystère IIc	F, D	1	38	1 Atar 101D, *6,615*	16,442	2f 30mm	655	I.P.: 150 for Fr., about 100 built to date (wide sub-contract).
Mystère IVA	F, D	1	36	1 H-S Verdon, *7,717†*	16,600	2f 30mm, 55 s.r.	696s	I.P.: 225 "off-shore", deliveries in progress.
Mystère IVN	F, AW	2	36	1 H-S Avon, *8,000†*	23,000	2f 30mm, 52 s.r. + 2 g.w.	M = 0.97	Pr. Also IVB, F, B, D, single-seat for prodn.
Mystère 26	F, A	1	25	1 Orpheus, *4,500*	10,000	2f 30mm + r.	M = 1+	S-T: First to fly this summer.
Flamant	T, Trspt.	2	68	2 SNECMA 125, 1,160	12,760	10 pass., or trg. eqpt.	230	I.P. (66 with R-985s); O.P.: 318, generally as described.
Fouga								
Magister	T	2	37	2 Marboré II, *1,760*	6,314	2f 7.5mm, 2 55-lb r. + 220 lb	435	I.P.: 100 for Fr., 10 delivered; also naval version (2 Pr.).
Hurel-Dubois								
H.D.32	P, AS	7/10	148	2 Wright R-1820, 3,050	40,000	A-S gear + 10,000 lb + misc.	200	I.P.: 100+ for Fr.(N).
Morane-Saulnier								
733 Alcyon	T	2/3	37	1 Potez 6D, 240	3,800	3 seats + radio.	162	I.P.: 125 for Fr., also other versions, including 7 armed Alcyons for Cambodia.
475 Vanneau	T	2	35	1 H-S 12Y, 850	6,268	2f 7.5mm, light r. and b.	342	O.P.: 199 built; also 230 of other versions.
760 Paris	L	1	33	2 Marboré II, *1,760*	7,475	4 seats	407	Pr.: order for 100 anticipated.
Nord								
856A Norvigie	A.O.P.	2	40	1 SNECMA 4L, 140	2,198	Army radio, catapult gear	118	I.P.: 112 for Fr. (Army), many delivered.
2501 Noratlas	Transport	3/5	107	2 Hercules 758, 4,140	46,297	16,530 lb	273	I.P.: 120 for Fr., 70 delivered, wide sub-contract.
1402 Gerfaut	F, D	1	21	1 Atar 101C, *6,173*	7,936	Expcl. equipment	M = 1+	Pr., successor is 1501 interceptor (Atar 101G†).
Potez 75	Policing	2	43	1 Potez 8D, 480	5,350	Stores to 2,200 lb, inc. g.w.	170	Pr., flown 1953, orig. designed for tactical attack.
S.I.P.A. S.12	T	2	36	1 SNECMA 12S, 580	5,126	Training equipment	220	I.P.: 231 for Fr. Dev'd from Ar 396 (Fr.-Ger.).
Sud-Est								
5000 Baroudeur	F, A	1	33	1 Atar 101 C, *6,173*	14,200	2f 30mm, 3,960 lb ext.	646	2 Pr. + S-T; c-o from trolley, land on skid. Developments foreseen.
Mistral	F, B, D	1	38	1 H-S Nene 102, *5,000*	12,628	4f 20mm, 2,200 lb ext.	570	O.P.: 250 for Fr. development of Vampire with more power.
Aquilon	F,B, AW (N)	1-2	42	1 Fiat Ghost, *4,850*	14,950	4f 20mm, A.I. + ext. stores	590	I.P.: 100+ for Fr. (N), 1- and 2-seat, basis — Sea Venom. Deliveries proceeding.
Sud-Ouest								
90-95 Corse	T, Trspt.	2	59	2 SNECMA 12S, 1,180	12,346	13 pass., or crew trg. eqpt.	221	O.P.: tail- or nose-wheel; some are radar trainers (N).
4050 Vautour	F, B, A, R	1-3	50	2 Atar 101E, *15,434*	35,280	Various, up to 9,000 lb	720s	I.P.: 70 for Fr.; multi-purpose; Prs. with Avons, Sapphires.
9050 Trident	I.D.	1	27	3 SEPR rockets, *9,900*	13,000+	Includes s.r. and g.w.	M = 1+	Pr. Also has turbojets; data from S.O.9000 (2 Pr. flown).
1221 Djinn	A.O.P.(H)	2	33R	1 Palouste, *250*	1,390	Army "walkie-talkie"	80	I.P.: for Fr. Army; tip-drive rotor.
GERMANY								
Ar 968	T	2	36	1 Argus, 465	3,747	—	210	O.P.: 400+ built in Cz. since 1945; used by "satellite" countries.
Bu 133 Jungmeister	T	1	22	1 Siemens, 160	1,290	—	134	O.P.: used by Sp. (C.A.S.A. 1133), Switz., Cz., Neth.
Bu 181 Bestmann	T	2	35	1 Hirth, 105	1,650	—	125	I.P. in Egy. (Cz-licence); O.P.: Neth (1,000), Swe., Cz., Rum., Switz.
Fi 156 Storch	L, A.O.P.	1	47	1 Argus, 240	3,100	3 seats	109	O.P.: used in Fr. (some with radial eng.), Spain, Cz., etc.
Fw 44 Stieglitz	T	2	29	1 Siemens, 150	1,900	—	115	O.P.: built in Braz., Swe., and used by Arg. and Fin.
Fw 58 Weihe	T	2-5	69	2 Argus, 480	6,500	—	150	O.P.: built in Braz.; used by Rum., etc.
He 111	B	5	74	2 Jumo 211, 2,680	26,500	5m 7.9mm, 4,400 lb int.	245	O.P.: 236 built in Sp., 1942-50.
Ju 52/3m	Transport	3	96	3 B.M.W. 132, 2,250	24,200	18 pass. or 7,000 lb	165	O.P.: 330 Fr. (A.A.C.1.), 100 Sp. (352-L), Nor., Port, Yu., Cz., Rum.
Me 109	F, T.	1-2	33	1 H-S 12Z, Jumo or Merlin, 1,300	6-8,000	Up to 5 guns, 2,200 lb ext.	400	O.P.: Cz. (Jumo), Sp. (H-S or Mer.) many versions, Switz., Fin., Yu., Isr., Rum.
Si 204	Misc.	2	72	2 Renault or Argus, 1,180	12,500	8 pass. or trg. eqpt.	219	O.P.: Many versions: 350 Fr. (Martinet), 100+ Cz. (C.3).
GREAT BRITAIN								
Armstrong Whitworth								
Meteor N.F.14	NF	2	43	2 Derwent, *7,000*	20,000	4f 20mm, A.I.	590	I.P.: N.F. Meteor: Fr., Bel., Den.
Auster 6, 7	L, T.	2-3	36	1 Gipsy Major 7, 145	2,122	—	122	O.P.: Bel., Bur., Can., Grc., In., Indon., Jor., Neth., N.Z., Pak.
A.O.P.9	A.O.P.	2-3	36	1 C. Bombardier 203, 173	2,100	—	127	I.P. for British Army and In.
Avro: Anson 18-20	G-P	2-6	57	2 Cheetah 15, 840	10,400	7 pass., or crew trg. eqpt.	171	O.P.: Afgh., Aus., Bel., Can., Egy., Eir., Eth., Fr., Grc., In., Iran., Iq., Isr., Neth., N.Z., S.Rh.

Country Manufacturer and Type (1)	Main Duties (2)	Crew (3)	Span (ft) (4)	Power Units No, type and total h.p. or lb thrust. (5)	All-up weight (lb) (6)	Typical Service load (7)	Max. Speed (m.p.h.) (8)	Remarks (9)
Lancaster	M.R.	7	102	4 Merlin 224, 6,480	68,000	15,000 lb stores	265	O.P.: Can., Fr. (N).
Lincoln	B, R	7	120	4 Merlin 68, 7,000	82,000	2m 20mm, 2-4m 0.5in, 20,000 lb	290	O.P.: Arg., 61 long-fuselage B.30s with Aust. employed on AS patrols.
Shackleton	M.R.	10	120	4 Griffon 57, 9,820	n.a.	2-4m 20mm	n.a.	I.P.: Mk 3 (rosewheel), S.Af.; O.P.: Mks1 and 2.
Vulcan B.1	Med.B	5	99	4 Olympus, *44,000*	n.a.	No defensive armament.*	n.a.	I.P.: deliveries 1955 onwards.
Blackburn & G.A.								
Beverley C.1	Transport	3-4	162	4 Centaurus 173, 11,400	135,000	50,000 lb	238	I.P.: deliveries to R.A.F. during year.
Boulton Paul								
Balliol T.2	T	2	39	1 Merlin 35, 1,280	8,410	1f 0.303in, 4r, trg. eqpt.	288	O.P.: Cey.; Also Sea Balliol, G.B.(N).
Bristol 170 Mk 31	Transport	3	108	2 Hercules 734, 4,000	44,000	6 tons, heavy eqpt., para-drop.	225	I.P.: Aust., Can., N.Z., Pak. (70).
Sycamore	G-P(H)	1-5	49R	1 Leonides 73, 520	5,400	Eqpt. for cas. evac., AS., ASR.	127	I.P.: 100 for G.B. (A.F., Army); Bel., Aust. (N); various Mks.
de Havilland								
89B Rapide	T, Trspt.	1-3	48	2 Gipsy Six II, 410	5,550	8 pass., or 4-5 pupils	150	O.P.: Bel., Jor., Neth., N.Z., Peru., Port.; also G.B.(N).
82 Tiger Moth	T	2	29	1 Gipsy Major, 130	1,770	—	109	O.P.: Aust., Bel., Bur., Fr., Grc., In., Iran, Irq., Jor., Neth., N.Z., Pak., Port., S.Af., S.Rh.
103 Hornet	F, R	1-2	45	2 Merlin 134-5, 4,060	18,500	4f 20mm, 8r, 2,000 lb	460	O.P.: Sea Hornet
98 Mosquito	F, B, R, T	2	54	2 Merlin, 2,400-3,400	25,000	4f 20mm, 4,000 lb, A.I.	400	O.P.: Bel., Bur., Col., Dom., Fr., N.Z., Nor., Port., Swe., Tur., Yu.
100 Vampire	F, B, D [a]	1	38	1 Goblin 3, *3,350*	12,390	4f 20mm, 2,000 lb ext.	548	I.P.: *Aust.* (Nene), Egy., Fin., Fr., In., Irq., It., Leb., N.Z., Nor., S.Af., S.Rh., Swe., Swi., Ve.
Vampire N.F.	NF	2	38	1 Goblin 3, *3,350*	13,100	4f 20mm, A.I.	535	O.P.: In., It., Swi.
Vampire Trainer	T	2	38	1 Goblin 35, *3,500*	11,680	2f 20mm, 1,000 lb ext.	550	I.P.: Aust., Bur., Chile, Egy., Fin., In., Irq., Leb., N.Z., Nor., Port., S.Af., S.Rh., Swi., Ve.
112 Venom F.B. 1,4	F, B	1	42	1 Ghost, 4,850/5,300	n.a.	4f 20mm, 3,000 lb ext.	650	I.P.: Swi. (100), Bur., Irq., It. Mk. 4, powered controls.
Venom N.F. 2, 3, etc.	NF NF(N)	2	42	1 Ghost, 4,850/5,300	n.a.	4f 20mm, A.I.	600+	I.P.: Swe.; Sea Venom 21, Aust.(N), N.F.3 —powered controls.
D.H.110	F, B, AW.	2	51	2 Avon, *20,000*	n.a.	f 30mm, g.w., A.I.	n.a.s	I.P.: carrier-based.
104 Devon	T, Trspt.	1-6	57	2 Gipsy Queen, 760	8,800	Up to 11 seats, or trg. eqpt.	210	I.P.: Arg., Egy., Eir., Eth., In., Irq., Jor., Leb., N.Z., Pak., S.Af.
English Electric								
Canberra B.6	B	3	64	2 Avon, *15,000*	n.a.	No guns, 6,000+ lb int.*	600+	I.P.: Ecu. Mk. 20 I.P. Aus. (48+); T.4, P.R.7. O.P.: Mk 2, Ven.
Canberra B.8	A, AW	2	64	2 Avon, *15,000*	n.a.	4f 20mm, various other a/c.	600+	I.P.
P.1A	F	1	n.a.	2 Sapphire	n.a.	n.a.	M—1+	S-T: Prs. + 20 development a/c of different detail design, some to fly this year.
Fairey								
Gannet A.S.1	AS(N)	3	54	1 Double Mamba, 3,190	n.a.	Internal load + radar	300+	I.P.: Aus.(N) 40; Dual T.2.
Firefly 1-3	G-P(N)	1-2	45	1 Griffon 12, 2,000	12,000	Trg. or towing eqpt.	300	O.P.: Aus.(N), Can.(N), Den., Ecn., In.(N), Neth.(N), Swe., Thai. Also 3-seat T.7 and pilotless Mk 8.
Firefly A.S.6	AS, T(N)	2	41	1 Griffon 74, 2,020	13,927	AS gear, strike radar	355	O.P.:
Folland, Gnat F.1.	F, B, D	1	22	1 Orpheus, *4,500*	8,223	2f 30mm, 2,000 lb ext.	M—1+	S-T: Evaluation G-B; prob. export.
Gloster, Meteor F.8	F, D	1	37	2 Derwent, *7,200*	17,350	4f 20mm	592	O.P.: Bel., Bra., Den., Egy., Isr., Neth.
Meteor P.R.10	R	1	43	2 Derwent, *7,200*	15,330	Camera installation	575	O.P.: Also F.4, Arg., Den., Isr., etc.
Meteor T.7	T	2	37	2 Derwent, *7,200*	14,000	No armament	590	O.P.: Arg., Aus., Bel., Bra., Den., Egy., Fr., Isr., Neth., Nor.
Javelin, F.A.W.1	F, AW	2	57	2 Sapphire, *16,000*	n.a.	4f 30mm, g.w., A.I.	n.a.s	I.P.: Deliveries through 1955-7; "off-shore" orders.
Handley-Page								
Hastings	Transport	5-7	113	4 Hercules 106, 6,700	80,000	20,000 lb. or weather-eqpt.	348	O.P.: N.Z. Also V.I.P. and Met. recce. *
Victor B.1	Med.B	5	110	4 Sapphire, *40,000+*	n.a.	No defensive armament	n.a.	I.P.: 2 Pr., S-T qty. during 1955.
Hawker								
Hunter F.4	F, B, D	1	34	1 Avon, *8,000*	n.a.	4f 30mm + ext. load	700+s	I.P.: *Bel., Neth.*, Fr., Den., "off-shore."
Hunter F.5	F, B, D	1	34	1 Sapphire	n.a.	4f 30mm + ext. load	700+s	I.P.: Swe. (J34).
Sea Hawk F.B.3	F, B, D(N)	1	39	1 Nene, *5,000*	n.a.	4f 20mm + ext. load	630	I.P.: "Off-shore"; Arm. Whitworth.
Sea Fury F.B.11	F, B, D(N)	1	38	1 Centaurus 18, 2,480	12,350	4f 20mm, 2,000 lb ext.	450	O.P.: Aus.(N), *Neth.*(N); Fury (F.B., T.): Egy., Irq., Pak.
Hunting Percival								
Provost T.1.	T	2	35	1 Leonides 25, 550	4,400	Optional: 2f 0.303in, 500 lb	201	I.P.: Bur., Eir., Irq., S.Rh.
Jet Provost T.1	T	2	35	1 Viper 101, *1,750*	6,750	Optional: 2f 0.303in, 500 lb	324	S-T: Several flying.
Pembroke	G-P	2-8	65	2 Leonides, 1,120	13,000	8 pass., 6 pupils or 2,500 lb	220	I.P.: Bel., Fin., Swe. Also Prince, Sea Prince Aus., G.B.(N).
Prentice T.1.	T	2-3	46	1 Gipsy Queen 32, 251	4,200	Mil. trg. eqpt.	140	O.P.: Arg., *In.* (62 by Hindustan), Leb.
Scottish Aviation								
Pioneer C.C.1	L, C-E	1	50	1 Leonides 501, 550	5,800	5 seats; stretchers	162	I.P.: (R.A.F. overseas).
Short								
Seamew A.S.1	AS, AS(N)	2	55	1 Mamba	14,000	AS weapons int. and ext., radar	n.a.	I.P.: G.B. (Coastal Command, R.N.).
Sunderland M.R.5	R	10	113	4 P. and W. R-1,830, 4,800	66,400	ASR or AS gear	242	O.P.: Fr., N.Z., S.Af.
Vickers-Armstrongs								
Valiant B.1	Med.B	5	114	4 Avon, *40,000+*	n.a.	No defensive armament.*	600+	I.P.: Large orders; R and FR versions.
1,000	Transport	n.a.	140	4 Conway	n.a.	n.a.	600+	Type 1002 I.P. for Transport Command.
Valetta	T, Trspt.	2-4	89	2 Hercules 230, 3,950	36,500	9,000 lb, 36 pass. or 10 pupils	294	O.P.: Also O.P.: Viking, Arg., Bra., In.
Varsity	T	3-9	96	2 Hercules 264, 3,900	37,500	Crew trg., bombing eqpt.	288	O.P.
Attacker F.B.2	F, B, D(N)	1	37	1 Nene 102, 5,100	17,350	4f 20mm, 3,000 lb ext.	590	O.P.: 145 for G.B.(N); Land-based version (36) for Pak.
Swift F.4	F, B, D	1	32	1 Avon, *8,000†*	n.a.	4f 30mm, under-wing racks	700+s	I.P.: 60+ built; production curtailed.
N.113	A, AW(N)	1	n.a.	2 Avon	n.a.	30mm, g.w.*	M—1+	I.P.: Pr. this year, dev'd from Type 525.
Spitfire 16	F, T	1	37	1 Merlin 266, 1,500	8,000	2f 20mm, 2f 0.50in., 1,500 lb	400	O.P.: Various Mks with Bel., Bur., Den., Egy., Eir., Grc., In., Isr., It., Neth., Nor., Port., S.Af., Sy., Tu., Yu.
Westland								
Wyvern S.4	A(N)	1	44	1 Python, 4,110	n.a.	4f 20mm, 3,000+ lb ext.	450+	O.P.: Standard strike aircraft.
Dragonfly	G-P(H)	1-4	49R	1 Leonides 50, 550	5,700	ASR winch, C-E gear, etc.	103	I.P.: Thai., Yu.
INDIA								
Hindustan HT-2	T	2	35	1 Cirrus Major, 155	2,200	—	140	I.P.: 300 on order, 50+ built. All-metal.
ITALY								
Ambrosini								
Sagittario II	F, A, D	1	25	1 Derwent 9, *3,600*	7,000	Guns + 2,000 lb ext.	M—1+	Pr. for NATO evaluation.
Fiat G.212	T, Trspt.	3-5	96	3 P. and W. R-1830, 3,600	39,600	22 pass., crew trg. or freight	236	O.P.: G.12 is earlier, lower-powered. 150+ in use.
G.46	T	1-2	34	1 Alfa 115, 225	3,109	1f 7.7mm optional	194	O.P.: 240+ for Italy, also Arg., Syr.
G.59	T	1-2	39	1 Merlin, 1,420	7,275	1f 7.7mm optional	373	O.P.: It., Arg., Syr. 1-seater can have 4f 20mm + 2,000 lb.
G.80	T	2	39	1 Fiat Goblin, *3,500*	12,566	2f 20mm. 2,200 lb ext.	534	S-T: (10). Many prototype versions.
G.91	F, A	1	n.a.	1 Orpheus, *4,000*	7,000+	4f 20mm, 2,000 lb ext., A.I.	600+	S-T: for NATO evaluation.
Macchi MB.308	L	2	33	1 Cont. C-145, 145	1,430	—	126	O.P.: 80 in service. Nose-wheel, high wing.
Piaggio P.136	ASR	2-5	44	2 Franklin, 430	5,500	Recce. eqpt.	175	O.P.: 14 used around coast. Amphibian.
P.148	T	2-3	36	1 Lycoming O-435, 190	2,646	—	146	O.P.: 100, standard aerobatic trainer.
NETHERLANDS								
Fokker S.11	T	2-3	36	1 Lycoming O-435, 190	2,426	—	130	I.P.: *In. Braz.*(150); O.P.: *Neth.*(100), *It.* (150 Macchi), Isr.
S.14	T	2	39	1 F.N. Derwent 8, *3,470*	11,800	2f 20mm + trg. weapons	440	I.P.: *Neth.*(20), *Braz.*(50). Pr. has had Nene 3.
SPAIN								
A.I.S.A. HM-1B	T	2	32	1 Tigre G-IVB, 150	1,870	—	143	O.P.: HM-1 (open cockpits), 70 built, HM-9 tug, 30 built.
I-115	T	2	31	1 Tigre G-IVB, 150	2,183	—	142	I.P.: 200 as standard primary machines.
C.A.S.A. 201	T	2-12	60	2 Cheetah, 950, or Sirio, 1,000	11,230	Eqpt. for crew training	203	I.P.:100 for various trg. functions.
202	Transport	2-3	71	2 Beta IC, 1,550	16,500	18 seats, 4,400 lb	214	I.P.: 20 for transport squadrons.
207	Transport	3-5	91	2 Hercules 758, 4,140	34,600	38 pass., 10,500 lb	263	I.P.: 52 for transport squadrons.
Hispano HA-43	T	2	33	1 Cheetah, 475	4,510	2f 7.7mm, 6 r underwing	208	O.P.: Many versions, some with fixed u/c.
HA-100	T	2	34	1 Beta 9C, 750	6,320	2f 12.7mm, 450 lb ext.	290	S-T: nosewheel, evaluation, to replace HA-43.

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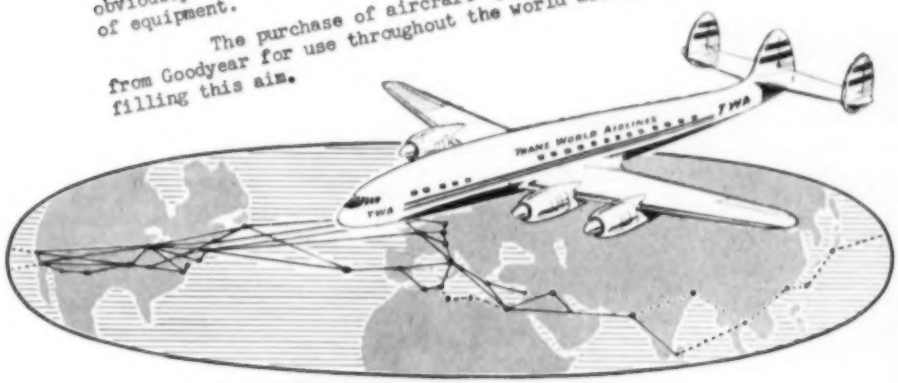

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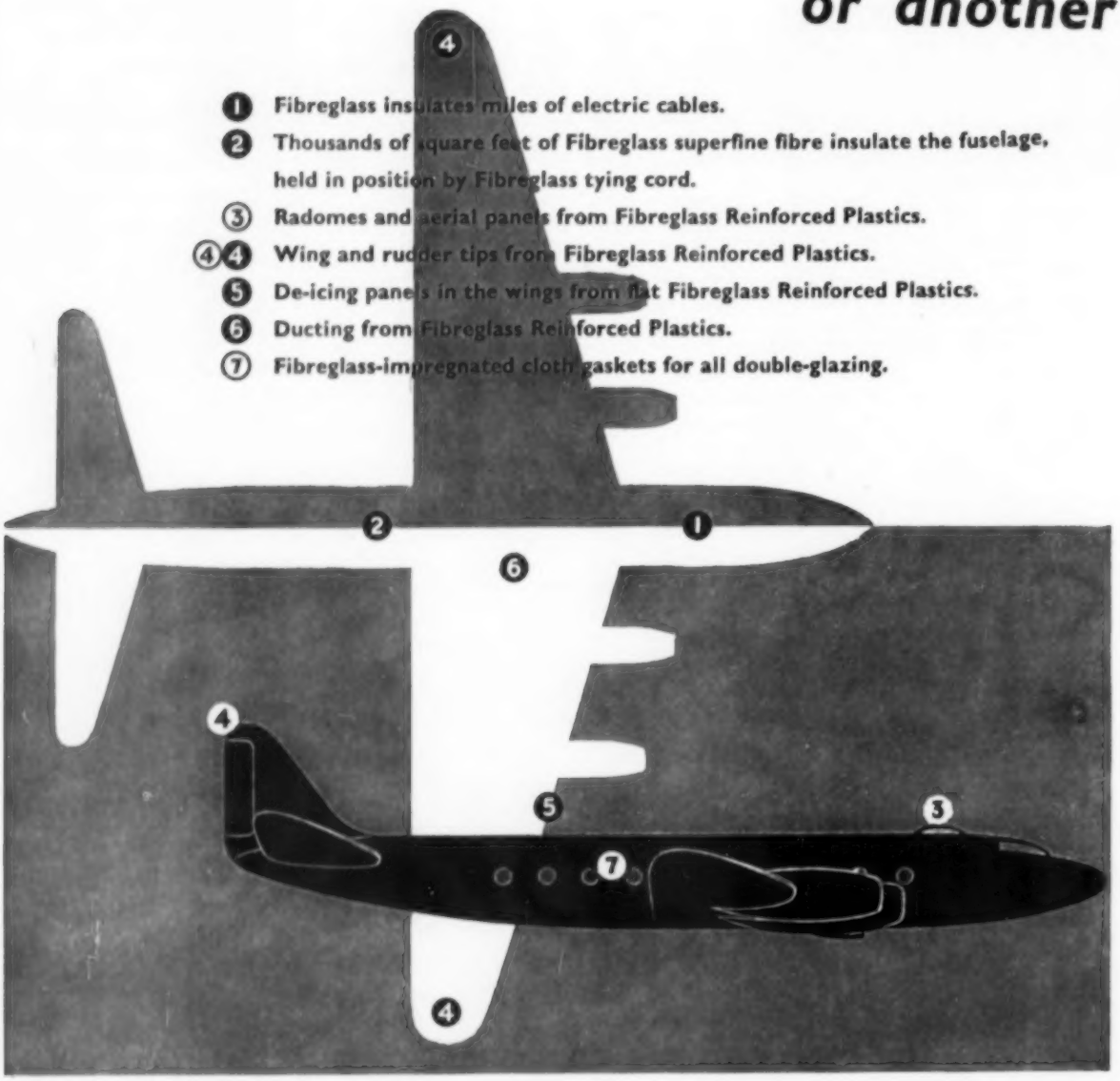
Country Manufacturer and Type (1)	Main Duties (2)	Crew (3)	Span (ft) (4)	Power Units No, type and total h.p. or lb thrust. (5)	All-up weight (lb) (6)	Typical Service load (7)	Max. Speed (m.p.h.) (8)	Remarks (9)
SWEDEN								
Saab 18B	A, R	3	56	2 S.F.A. DB 605, 2,950	19,400	1f 57mm, 2m 20mm, 3,300 lb	354	O.P.: Mostly weather recce.
21A	A, D	1	37	1 S.F.A. DB 605B, 1,475	12,300	1f 20mm, 4f 13.2mm, 2,200 lb	398	O.P.: 400 built; 60 more with Goblin, 535 m.p.h.
29F	F, B, D	1	36	1 S.F.A. Ghost, *5,000*†	13,600	4f 20mm, 2,200 lb ext.	685	I.P.: 650+ for all F, R (unarmed) and A duties. 29F has afterburner.
32	A, AW	2	43	1 S.F.A. Avon, *8,000*†	22,050	4f 20mm, s.r. + g.w.	720s	I.P.: Many versions planned.
91B	T, L	2-4	35	1 Lycoming O-435, 190	2,320	Can be: 2f 8mm, + 440 lb ext.	171	I.P. by de Schelde (*Neth.*), 120 for Swe. O.P.: Ethiopia.
SWITZERLAND								
F.F.A. P-16	A, AW	1-2	n.a.	1 Sapphire	15,000+	Guns, r + g.w.	600+	Pr.: to fly shortly. Venom-replacement.
Pilatus P-2	T	2	36	1 Argus (Cz.), 465	3,970	1f 7.92mm, + b + r.	211	O.P.: Standard advanced trainer.
U.S.A.								
Beech T-34 Mentor	T	2	33	1 Continental O-470, 225	2,900	Can carry trg. weapons	188	I.P.: (U.S.A.F., U.S.N.), Can., Chile, Col., Jap.
AT-7, 11 Expediter	T, Trspt.	1-5	48	2 P. and W. R-985, 900	8,750	Up to 7 pass., or trg. eqpt.	230	I.P.: Arg., Bol., Bra., Can., Chile, Dom., Ecu., Fin., Fr., G.B.(N), Gua., Hai., Hon., It., Mex., Neth., Par., Peru, Por., Sal., Swe., Syr., Tu., Ur., Ve.,
Bell Model 47, H-13	G-P(H)	1	35R	1 Franklin O-355, 200	2,350	2 seats, various spec. eqpt.	90	I.P.: Arg., Nor.; to be *It., Jap.* Many versions.
HSL-1	AS(H)	4	52R	1 P. and W. R-2800, 1,900	n.a.	AS, sonar, a.u.m.	138	I.P.: Tandem rotor. Autopilot.
Boeing B-17	G-P	4-10	104	4 Wright R-1820, 4,800	56,000	Eqpt. for Met., AS, ASR, B, Trspt.	290	O.P.: (U.S.A.F., N, C.G.), Den., Dom., Isr., Por.
PT-17 Kaydet	T	2	32	1 Wright, Lycoming or Jacobs 220	2,717	—	124	O.P.: Arg., Bol., Col., Cuba, Dom., Gua., Hon., Isr., Nic., Par., Peru.
B-29 Superfort.	R, B	7-14	141	4 Wright R-3350, 8,800	135,000	Eqpt. for Met., ASR, FR, B.	360	O.P.: Used as B by Nicaragua.
KC-97G Stratofreighter	FR, Trspt.	5	141	4 P. and W. R-4360, 14,000	175,000	130 pass., FR, O-E, etc.	375	I.P.: 600+ delivered.
KC-135A Stratotanker	FR, Trspt.	5-7	130+	4 P. and W. *175, 60,000*	240,000+	100+ pass., FR eqpt.	600+	I.P.: Smaller Pr. flying. 400 on order.
B-47E Stratojet	Medium B	3	116	6 G.E. *147, 36,000*	202,000	2m 20mm, 20,000 lb, camera pod, GAM-63 (Rascal)*	600+	I.P.: 2,000 delivered from 3 factories; 2 otherIversions.
B-52B Stratofortress	Heavy B	6	185	8 P. and W. *157, 87,200*	350,000	4m 0.5in, 75,000 lb, camera pod, GAM-63 (Rascal)*	600+	I.P.: Deliveries from 2 factories; FICON gear; other versions.
Cessna T-37A	T	2	33	2 Continental *169, 1,800*	5,600	Full trg. eqpt.	393	I.P.: Prs. flying.
L-19A Bird Dog	L, A.O.P.	2	36	1 Continental O-470, 213	2,200	A.O.P., C-E, light weapons	146	I.P.: Can.; also OE-2 (U.S.M.C.), 260 h.p.
Chance Vought XF8U	F, AW(N)	1	n.a.	1 P. and W. *157, 10,000*†	20,000	n.a.; A.I.	M=1+	I.P.: Pr. flew April '55. V-incidence, high, swept wing.
F7U-3 Cutlass	F, B(N)	1	39	2 Westinghouse J46, 9,600†	31,642	4f 20mm, 5,400 lb, 60+ s.r.	700s	I.P.: R, A and g.w. versions.
F4U-5N Corsair	F, B, AW(N)	1	41	1 P. and W. R-2800, 2,500	15,700	4f 20mm, 4,800 lb or A.I.	470	O.P.: (U.S.M.C.), Fr.(N), Viet-Nam.
Convair B-36	Hea.B., R	15	230	6 R-4360+4 *J47*, 22,800 +24,000	400,000+	16m 20mm, 84,000 lb*	435+	O.P.: 380 built, many special exptl. a/c. FICON gear.
XB-58 Hustler	Med.B.	n.a.	n.a.	8 G.E. *179, 120,000*†	n.a.	n.a.*	1,000	S-T: Pr 1955; delta; steel honeycomb sandwich airframe.
C-131D Samaritan	C-E, Trspt.	3	105	2 P. and W. R-2800, 4,800	46,500	Up to 44 seats, 27 stretchers	314	I.P.: Also C-131A, smaller, equivalent to CV-240. Also turboprop (T56) test-beds.
F2Y-1 Sea Dart	F	1	31	2 Westinghouse J46, 9,600†	22,000	Exptl. eqpt.	600+s	S-T: 1 or 2 hydroskis. Various developmts.
F-102A	F, AW	1	38	1 P. and W. *157, 10,900*†	30,000+	6 GAR-98 Falcon. RFC.	M=1.5	I.P.: Also DF-102, TF-102 tandem, dual.
PBY-5, 5A Catalina	G-P	4-9	104	2 P. and W. R-1830, 2,400	34,000	AS, ASR, R or up to 18 seats	188	O.P.: Arg., Bra., *Can.*, Chile, Col., Cuba, Den., Dom., Ecu., Fr.(N), Indon, Neth., N.Z., Nor., Peru, U.S.S.R.
R3Y Tradewind	Transport	6	145	4 Allison T40, 22,000	160,000	103 pass., 92 stretchers, 50,000 lb	370+	I.P.: Pressurized flying-boat; R3Y-2 has bow-loading.
T-29 Flying Classroom	T	4	92	2 P. and W. R-2800, 5,000	43,575	Radar or bombardier training	300	I.P.: Several versions.
BT-13 Valiant	T	2	42	1 P. and W. R-985, 450	4,400	—	164	O.P.: Arg., Bol., Dom., Gua., Haiti, Hon., Indon., Peru, Sal.
Douglas C-47, R4D	Transport	3	96	2 P. and W. R-1830, 2,400	26,000	6,500 lb or up to 32 seats	225	O.P.: Used by virtually every country, including 46 Air Forces. Also R4D-8 (Super Dakota) U.S.(N), and Li-2 U.S.S.R. and other Communist countries.
C-54, R5D	Transport	4-6	118	4 P. and W. R-2000, 6,160	73,000	44-50 seats, 30+ stretchers	275	O.P.: Arg., Bel., Par. Some R5Ds are weather recce with much radar.
C-118, R6D	Transport	5	118	4 P. and W. R-2800, 10,000	106,000	76 seats, 30,000 lb	372	I.P.: Standard M.A.T.S. transport.
C-124C Globemaster	Transport	5-8	174	4 P. and W. R-4360, 15,200	220,000	200 seats, 127 stretchers, etc.	319	I.P.: Dev'd from C-74 (14 with M.A.T.S.); turboprop versions.
XC-132	Transport	n.a.	n.a.	4 P. and W. XT57, 72,000	400,000	100,000 lb	500	Pr.: Planned as FR for B-58; now to be heavy transport.
XC-133A	Transport	5-8	n.a.	4 P. and W. T34, 24,000	255,000	20 tons cargo	400	Pr.: High wing, pressurized.
B-26 Invader	A, R	3	70	2 P. and W. R-2800, 4,000	32,000	4m 0.50 in, f guns + 5,000 lb + r	340	O.P.: Fr., Tu., Viet-Nam. Also U.S.A.F. Europe. Several versions.
B-66B	Tac.B	3	73	2 Allison J71, 19,500	83,000	2m 20mm, 20,000 lb int.*	600+	I.P.: Various A, B, R versions.
AD Skyraider	G-P(N)	1-3	50	1 Wright R-3350, 2,700	18,500	2-4f 20mm, 8,000 lb load for A, AS, EW, P, R & Trspt.*	365	I.P.: Nearly 3,000 built. G.B.(N), Nat. China: very many functions.
A3D Skywarrior	A(N)	3	73	2 P. and W. *157, 20,080*	73,000	2m 20mm, various stores*	600+	I.P.: Carrier-based.
A4D Skyhawk	A(N)	1	28	1 Wright *J65, 7,800*	15,000	No guns, 5,000 lb ext.*	650+s	I.P.: Carrier-based, wing does not fold.
F4D Skyray	F, AW(N)	1	34	1 P. and W. *157, 10,000*†	20,000+	4f 20mm, 4,000 lb or 7A s.r.	M=1+	I.P.: Carrier-based, squadrons forming.
Fairchild M-62 Cornell	T	2	37	1 Ranger or Continental 175-220	2,700	—	125	O.P.: *Bra., Can.*, Chile, Ecu., Haiti, Mex., Nic., Nor., Par., Peru., Ph., Sal., Ur.
C-119G Boxcar	Transport	5	109	2 Wright R-3350, 7,000	77,000	30,000 lb, 67 pass., 35 stret.	296	I.P.: (U.S.A.F., U.S.M.C.) Bel., Can., Fr., In., It., Neth.
C-123B	Transport	2	110	2 P. and W. R-2800, 5,000	60,000	16,000 lb, 60 pass., 60 stret.	285	I.P.: Originally Chase design. Limited production (160).
Grumman TBM Avenger	AS(N)	3	54	1 Wright R-2600, 1,750	15,640	Search, AS or EW eqpt.	272	O.P.: *Can.*, G.B.(N), Jap, Neth., N.Z., Ur.
AF-2 Guardian	AS(N)	2	61	1 P. and W. R-2800, 2,400	24,700	Search or strike eqpt.	303	O.P.: Being replaced by Sentinel.
F8F Bearcat	F, B, D(N)	1	36	1 P. and W. R-2800, 2,500	9,900	4f 20mm, 2,000 lb ext.	447	O.P.: (U.S.N.R.), Fr., Thai., Viet-Nam.
F9F-8 Cougar	F, B, D(N)	1	35	1 P. and W. *J48, 7,200*†	21,700	4f 20mm, 4,000 lb ext.	700s	I.P.: (N, MC), also R version. Developed from Panther, O.P.
F11F-1 Tiger	F, (N)	1	32	1 Wright *J65, 10,800*†	15,000	S.r., g.w.	M=1+	I.P.:
S2F Sentinel	AS, Trspt.	4	70	2 Wright R-1820, 3,050	n.a.	Search and attack eqpt.	300	I.P.: Also *Can.*(N), de Havilland Canada.
UF, SA-16 Albatross	AS, R	6	80	2 Wright R-1820, 2,850	34,000	Rescue eqpt., search radar	275	I.P.: (AF,N,CG), flying-boat, wheels, skis.
Hiller H-23, HTE	G-P(H)	1	35R	1 Franklin O-335, 200	2,500	3 seats	86	I.P.: (AF,N, Army, CG), G.B.(N), Indonesia.
Kaman HOK	L(H)	2	47R	1 P. and W. R-1340, 600	n.a.	4 seats, 2 stret. and orderly	n.a.	I.P.: } U.S.N., U.S.M.C., intermeshing rotors
HTK	T(H)	2	42R	1 Lycoming O-435, 240	3,100	2 or 3 seats, 1 or 3 stretchers	77	I.P.: }
Lockheed Lightning	F, R, D	1-2	52	2 Allison V-1710, 3,040	18,000	Photo. eqpt. or weapons	420	O.P.: Cuba., Dom., Fr., Hon., It., Nic.
F-80 Shooting Star	F, T, etc.	1	39	1 Allison *J33, 5,200*	15,336	6f 0.50 in. 2,000 lb	588	O.P.: Nat. China, S.Kor., DF-80 director, QF-80 drone.
F-94C Starfire	F, AW	2	39	1 P. and W. *J48*, 6,900†	27,000	48 s.r., or (DF-94C) 4 GAR-98	650	O.P.: 279 built; developed from F-94B. Has RFC.
F-104	F, D	1	22	1 Wright *J65, 8,000*†	15,000	4f 20mm, s.r., GAR-98	M=1+	S-T: 2 Pr flown, 1 destroyed. TF-104 dual. *J79* later.
T-33A, TV.	T	2	39	1 Allison *J33, 5,200*	15,000	2f 0.50 in (RT-33: cameras)	600	I.P.: (AF, N), Bel., Fr., Grc., Jap., Nat. China, Nor., Por., Tu., Yu. Also *Can.*, with Nene turbojet; T2V (U.S.N.), I.P. with boundary-layer control.
PV-1 Ventura	R, B, T	4	66	2 P. and W. R-2800, 4,000	31,000	Various; up to 6,000 lb	300	O.P.: Can., Dom., Fr., Peru, S.Af. Development is PV-2 Harpoon, Fr., Neth.(N).
P2V-7 Neptune	P, B	5-8	103	2 Wright T.C. 7,000, +2, *J34, 6,800*	75,500	Various guns, EW, magnetic detection, AS gear	415	I.P.: P2V-5, 6: Aus., Can., Fr.(N), G.B., Jap., Neth., N.Z.
C-121C, R7V, Super Con.	Transport	5	123	4 Wright T.C., 13,000	133,000	106 pass., 73 stret., or 38,000 lb	365	I.P.: V.I.P. versions, also T34-powered (2 U.S.A.F., 2 U.S.N.).
C-130A Hercules	Transport	4	132	4 Allison T56, 15,000	125,000	40,000 lb cargo	408	I.P.: Pressurized, equipped for heavy dropping and FR.

Country Manufacturer and Type (1)	Main Duties (2)	Crew (3)	Span (ft) (4)	Power Units No, type and total h.p. or lb thrust. (5)	All-up weight (lb) (6)	Typical Service load (7)	Max. Speed (m.p.h.) (8)	Remarks (9)
RC-121D, WV-2	EW	31-2	123	4 Wright T.C., 13,000	n.a.	13,000 lb electronic gear.	336	I.P.: Command centre, picket, 24+ hr endurance.
McDonnell								
F2H Banshee	F, AW(N)	1	45	2 Westinghouse J34, 6,500	21,200	4f 20mm, RFC	610	O.P.: 800 F2H, various versions, U.S.N., Can.(N).
F3H Demon	F, B, AW(N)	1	35	1 Allison J71, 9,200†	28,700	4f 20mm, s.r., 4,000 lb.	M=1	I.P.: 1st 60 had J40, some to have J73. AH-1 attack version.
F-101A Voodoo	F, B	1	38	2 P. and W. J57, 20,000†	32,000	4f 20mm, 5,500 lb.*	M=1+	I.P.: Classed "strategic fighter." Also RF-101.
Martin B-57B	Tac.B	2	64	2 Wright J65, 14,400	50,000	8f 0.50 in + 7,000 lb int./ext.	575+	I.P.: T, and other versions (Canberra).
P8M Mariner	P	9	118	2 P. and W. R-2800, 4,200	60,300	6m 0.50 in, 6,000 lb.	198	O.P.: U.S.N., Neth.(N). F-B or amph. Weapons in nacelles.
P5M Marlin	P, AS	7	118	2 Wright T.C., 6,800	73,055	2m 20mm, 12,000 lb, magnetic detection, AS.	250	I.P.: Flying boat. Weapons in nacelles and under wings.
P6M Sea Master	A, R	5	100	4 Allison J71, 40,000†	190,000	2m 20mm, 30,000 lb. int.	600+	I.P.: Flying boat. Mines or camera pod in hull.
North American								
F-51 Mustang	F, B, D	1	37	1 Packard V-1650, 1,500	11,100	6f 0.50 in, 2,000 lb ext.	437	O.P.: Aust., Can., C.R., Cuba, Dom., Fr., Hai., Indon., Isr., It., Nat. China, Neth., Ph., S.Af., S.K., Swe., Swi., Ur.
F-86D Sabre	F, AW	1	37	1 G.E. J47, 5,600†	19,000	24 s.r., RFC (E-4).	700s	I.P.: F-86K, MG-4, 4f 20mm, for NATO. Some assembled by Fiat, It.
F-86F Sabre	F, D	1	37	1 G.E. J47, 5,800	17,000	6f 0.50 in, 2,000 lb ext.	680s	I.P.: for NATO, Nat. China. F-86E earlier, built by Can., for G.B., Grc., Tu. Also FJ-2(N) and TF-86F dual.
F-86H Sabre	F, B, D	1	37	1 G.E. J73, 9,300	20,000+	4f 20mm, 4,000 lb ext.	630+	I.P.: Long-range low-attack variant.
FJ-3 Fury	F, D(N)	1	37	1 Wright J65, 7,200	18,000	4f 20mm, ext. stores.	680s	I.P.: Carrier-based.
FJ-4 Fury	F, D(N)	1	39	1 Wright J65, 7,800	19,500	4f 20mm, 4,000 lb ext.	690+s	I.P.: New airframe. Carrier-based.
F-100A Super Sabre	F, D	1	36	1 P. and W. J57, 10,000†	26,000	4f 20mm, 4,000 lb ext.*	M=1+	I.P.: Also F-100C (7,500 lb stores), D (as A) and TF-100 dual.
F-107	F, AW	1	n.a.	1 P. and W. J75, 15,000†	30,000	s.r., g.w., RFC.	M=1+	Pr. Developed from F-100; for M=1.7+.
B-25 Mitchell	B, T	3-6	68	2 Wright R-2600, 3,400	33,500	Up to 14 0.50 in, 8,000 lb.	270	O.P.: Bra., Can., Chile, Cuba, Indon., Nat. China, Neth., Peru, Ur., Ven. Used also as tug, photo., R.
B-45A Tornado	Light B.	3	90	4 G.E. J47, 20,800	102,000	2m 0.50 in, 20,000 lb. int.*	550	O.P.: Many used for target-towing; also RB-45C (cameras).
T-6 Texan (Harvard)	T	2	42	1 P. and W. R-1340, 600	5,500	Can have trg. armament.	206	I.P.: *Can.* for Can. and U.S.A.F.; O.P.: Used by at least 49 Air Forces.
T-28B	T	2	41	1 Lycoming (Wright) R-1820, 1,425	8,038	Training arm't, inc. s.r.	346	I.P.: (U.S.N.); also T-28A (U.S.A.F.), lower power.
AJ-2 Savage	A, FR (N)	3	71	2 P and W R-2800, 4,800	57,000	2f 20mm, 12,000 lb£ or FR.	380	O.P.: Some have J33 in tail. Photo-recce AJ-2P. Many used for weather recce.
Northrop								
F-89D Scorpion	F, AW	2	60	2 Allison J35, 10,400†	40,000+	104 s.r., RFC.	600+	I.P.: Also F-89C (6f 20mm) and E (GAR-9B g.w.).
Piasecki								
HUP-2, Retriever	G-P(H)	1	35R	1 Continental R-975, 550	6,100	7 seats, 3 stretchers	108	I.P.: Can. (N), Fr. (N). Also HUP-4 (700 h.p. R-1300) and H-25 Army Mule (Trspt., U.S. Army).
H-21, Work-Horse	G-P(H)	1-2	44R	1 Lycoming (Wright) R-1820, 1,425	15,000	18 seats, 12 stretchers	140	I.P.: Various types for U.S.A.F., Army, Can.
Piper L-18	L, T	2	35	1 Lycoming O-290, 135	1,500	—	129	I.P.: 300 U.S.A.F. flight-indoc'n; tandem-wheel version U.S. Army; L-18C, Bel.; L-4 (earlier) Indon., Isr., Neth., Ph., Tu.
Republic								
F-47D Thunderbolt	F, B, D	1	41	1 P and W R-2800, 2,300	16,000	8f 0.50in, 3,000 lb ext.	426	O.P.: Bra, Chile, Col.,(Dom., Ecu., Fr., Iran, Peru, Por., Ven., Yu.
F-84E, G Thunderjet	F, B, D	1	36	1 Allison J35, 5,600	18,000	6f 0.50in, 5,000 lb ext.*	605	O.P.: Bel., Den., Fr., Grc., It., Nat. China, Neth., Nor., Por, S.K., Tu., Yu.
F-84F Thunderstreak	F, B, D	1	34	1 Wright J65, 7,200	25,000	6f 0.50in. 5,000 lb ext.*	720s	I.P.: FICON atom-bomber. Liquid-rocket a.t.o.
RF-84F Thunderflash	R	1	34	1 Wright J65, 7,200	28,000	4f 0.50in, cameras	720s	I.P.: FICON photo-recce. aircraft.
XF-103	F, AW	1	n.a.	1 Wright J67, 15,000, + ramjet	n.a.	S.r., g.w., RFC	M=1+	Pr.: Common duct for both power-plants. Delta.
XF-105, RF-105	F, B	1	n.a.	2 P and W J57, 20,000+	n.a.	n.a.	M=1+	Pr.: Root intakes, was to have had J71s.
Ryan L-17 Navion	L	1	33	1 Continental E-TB, 205	2,750	4 seats, or O-E eqpt.	165	O.P.: North American design. U.S.A.F., Army, Dom., Grc.
Sikorsky								
S-55, H-19, HO4S	G-P(H)	2	53R	1 P.W. Wasp, 600, or Wright, 700	7,900	3-10 seats, 2,200 lb	110	I.P.: Can., Fr. (N), G.B. (AF, N), Jap., Neth. British (Westland)- built developments, G.B. (AF, N), Fr.
S-56, H-37A, HR2S	Trspt.(H)	2	90R	2 P and W R-2800, 3,900	28,500	26 seats, 10,000+ lb.	160	I.P.: (U.S.M.C., Army). Fitted for carrier operation.
S-58, HSS	AS(H)	2-5	56R	1 Lycoming (Wright) R-1820, 1,560	n.a.	A.S., sonar., a.u.m.; 5,000 lb.	160	I.P.: Also HUS (Navy, G-P), H-34 (20-seat, U.S.A.F.).
U.S.S.R.								
"Badger"	Medium B	n.a.	125?	2 turbojets, 30,000+	n.a.	Tail turret. Weapons bay.	n.a.	Prob.I.P.: Approximately parallels Valiant.
"Bison"	Heavy B	n.a.	170?	4 turbojets, 60,000+	n.a.	Tail turret. Weapons bay.	n.a.	Pr.: Probable weight about 250,000 lb; bicycle u/c.
"Bosun"	A.	n.a.	83	2 Vk-1 (Nene), 11,920	n.a.	Fixed + turret a/t, + int. load.	500+	I.P.: Unswept wing, swept tailplane.
"Butcher"	A	3	72	2 Vk-1 (Nene), 11,000	n.a.	4m 20mm, internal load.	550+	I.P.: Unswept wing, swept tail, many variants.
"Hare"	G-P(H)	1	n.a.	1 piston eng., about 500	n.a.	2-3 pass.	n.a.	I.P.: Widely used; larger than Sycamore.
"Hound"	G-P(H)	2	n.a.	1 piston eng., over 800	n.a.	At least 2,000 lb.	n.a.	I.P.: Widely used, larger than S-55, 4-blade rotor.
Il-10	A, R	2	45	1 AM-42, 2,000	14,800	Various f guns, 3,300 lb ext.	290	O.P.: wide use all Communist countries; dual T in Yu.
Il-14	Transport	4	101	2 ASh-82, 3,600	42,000	Up to 36 seats.	260	I.P.: with Il-12 is standard transport.
La-11	F, D	1	33	1 ASh-82, 1,850	7,000+	3f 23mm around cowling.	420	O.P.: devt. of LA-9, latter used by China, N.Kor.
Mig-9	T	1	41	2 M-004B, 4,000	9,000	Armament often removed.	593	O.P.: ex-fighter of 1947-9.
Mig-15	F, D	1	33	1 Vk-1 or RD-45, 6,000	14,238	1f 37mm + 2f 23mm	680	O.P. in U.S.S.R.; still I.P. in *Cz., Po.*; v. widely used; various versions.
Mig-17	F, B, D	1	n.a.	1	15,000+	n.a.	680+	I.P.: Probably M=1 in dive; larger than -15.
TU-2	A, R	4	62	2 ASh-82, 3,700	28,224	Up to 5 guns, 5,000 lb int.	340	O.P.: Satellite countries; long-span version and others.
TU-4	B, R	10	141	4 ASh-90 (R-3350), 10,000	120,000+	10m 12.7mm, 20,000 lb int.	350	O.P.: Copy of B-29, large number in service, many versions.
Yak-11	T	2	31	1 ASh-21, 750	5,000	Can have 1f 7.62mm	295	I.P.: From 1947 standard type; U.S.S.R., Ch., Hun., Po., Rum.
Yak-12	L, A.O.P.	1	40	1 M-11, 145	2,650	3 pass, or 2 stretchers + 1 seat	115	I.P.: Standard Communist light type; many versions.
Yak-17	T	1-2	30	1 M-004B, 2,000	4,800	2f 20mm optional + 1,000 lb.	500	O.P.: Tandem-seat, nosewheel; devt. of Yak-15 fighter.
Yak-18	T	2	35	1 M-11, 160	2,360	—	160	I.P.: Standard Communist basic trainer.
Yak-23	F, D	1	28	1 Derwent-devt, 3,500	5,500+	2f 20mm	600	Prob. O.P.: Satellite service, unswept.
YUGOSLAVIA								
Aero 2D	T	2	34	1 G. Major 8, 145	2,156	—	139	I.P.: Widely used, many versions.
Ikarus S-49C	F	1	34	1 Hispano 12 Z-17, 1,500	7,646	1f 20mm, 2f 12.7mm	390	Prodn. of 50+ prob. complete. Related to Yak-9 (U.S.S.R.).
Type 522 Vihor	T	2	36	1 P. and W. R-1340, 600	5,250	Can have training armament	245	I.P.: Standard type. Pr had Ranger eng.
Type 214	T, Trspt.	2-5	n.a.	2 P. and W. R-1340, 1,200	n.a.	10 pass. or crew trg. eqpt.	230+	I.P.: Multi-purpose, wood structure.

Col. 1. Aircraft are found under the country of design, except where another country builds a modified version. **Col. 2.** Functions are those in which the aircraft is at present mainly employed. Key: A, attack; AS, anti-submarine; ASR, air-sea rescue; AW, all-weather; A.O.P., air observation post; B, bomber; C-E, casualty evacuation; D, day use only; EW, early warning; F, fighter; FR, flight-refuelling; G-P, general purpose; (H), helicopter; I, intercepter; L, liaison; (N), naval carrier based; NF, night fighter; P, patrol; R, reconnaissance; T, trainer. **Col. 3.** Crew normally employed in flying the aircraft. **Col. 4.** R signifies rotor diameter. **Col. 5.** Total power is aggregate e.h.p. for all engines; in the case of turbojets, thrust is given in *italics*. † Indicates afterburning; the thrust given does not assume its use. **Col. 6.** Maximum authorized take-off weight. **Col. 7.** 2f 30mm = two fixed 30mm guns, alternative to "f" is "m" = movable; int./ext. = load carried internally or externally; r, rockets; s.r., spin-stabilized rockets; g.w., guided missiles; A.I., airborne interception radar; E.W., early-warning radar; RFC, radar fire-control; * signifies atomic capability. **Col. 8.** Level speed at best height; M=1+ signifies supersonic; s, supersonic in a dive. **Col. 9.** I.P.: in production; O.P.: out of production; Pr.: prototypes only; S-T: service-test quantity. Names of countries (abbreviated) using the type are considered self-explanatory, except for In = India. Countries *italicized* have built the aircraft concerned. The functional symbols of Col. 2 apply to this column. **N.B.** Letters n.a. = information not available.

Most British Aircraft use FIBREGLASS (TRADE MARK) in one form or another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North American B-25J Mitchells converted for reconnaissance with the Indonesian Air Force.

NU-200 Sikumbang prototype (Indonesian A.F.).

THE WORLD'S AIR FORCES . . .

INDONESIA

The Indonesian Air Force

KNOWN BY the contraction A.U.R.I., *Angkatan Udara Republik, Indonesia,* the Indonesian Air Force consists of over 10,000 officers, N.C.O.s and men. Air Headquarters is in the capital (Djakarta, Java); Halim Perdanakusuma is the home of the Training Command and the Composite Group Command; Husein Sastranegara houses the Air Maintenance Depot and technical squadrons; at Kalidjati are the basic and advanced flying schools; and at Abdulrachman Saleh is the 5th (Patrol) Squadron. The Composite Group comprises a bomber squadron, two transport squadrons, one fighter squadron, one liaison squadron and one patrol squadron, and the Training Command consists of nine units, including the flying school, which is sub-divided into the primary, basic and advanced flying schools.

Present tasks are the building up of the Force to a high standard with available means; maintaining internal security; air/sea rescue and air survey. The bomber squadron is equipped with North American B-25C, D and J Mitchells, the transport squadrons have Douglas C-47s, the fighter squadron is armed with North American F-51D and K Mustangs, the liaison squadron uses Austers and Cessna 180s, and the patrol squadron has Convair PBY-5A Catalinas. Piper L-4J Grasshoppers serve for primary flying training, Convair F-13A Valiants for basic flying training, North American T-6G and T-16s for advanced flying training, and Hiller 360s for helicopter training. An experimental jet training unit is being formed and will probably be equipped with de Havilland Vampire Trainers.

The first aircraft designed and built in Indonesia was constructed by the Aero-technical branch of the Indonesian Air Force and is now on test. Designated NU-200 Sikumbang (Bee), it is similar in character to the American Fletcher Defender, being a light ground-attack single-seater with an all-up weight of 2,400 lb, powered by a D.H. Gipsy Six engine.

IRAN

The Imperial Iranian Air Force

WE ARE officially informed that "at the moment there is no considerable Iranian Air Force." Equipment hitherto in use has included Thunderbolts, Dakotas, Hurricanes, Tiger Moths, PT-17s and AT-6s.

IRAQ

The Royal Iraqi Air Force

THE MOST modern aircraft delivered to this Service are D.H. Venom F.B.1s, which form the equipment of No. 5 Squadron now operating from the great R.A.F. base at Habbaniya. Vampires (fighters, night fighters and trainers) and Fury piston-engined fighter/bombers are other key types in a force which numbers among its second-line equipment the D.H. Dove and Tiger Moth and Avro Anson. It was announced in February this year that a substantial number of Hunting Percival Provosts, modified to carry a variety of underwing stores, had been ordered. A few weeks later new defence agreements between Great Britain and Iraq were disclosed, the central theme of which was that there should be close and continuous collaboration between the armed forces of the two countries. There would, for instance, be joint planning and exercises, so that if Iraq were attacked Great Britain would be in an effective position to support her. The United Kingdom would, moreover, give technical assistance in establishing an air-defence organization, including radar warning and an aircraft reporting system. The airfields at Habbaniya and Shaiba would pass under Iraqi control, when the British squadrons now stationed there would be progressively withdrawn.

It was agreed that R.A.F. squadrons should visit Iraq as part of the joint training process, and other R.A.F. personnel would remain in the country to service British aircraft and to install, operate and maintain facilities and equipment as well as to assist in the training of Iraqi forces. These men would be commanded by British officers, acting in liaison with the Iraqi officer commanding each establishment.

de Havilland Venom F.B.1 (Royal Iraqi A.F.).

de Havilland Vampire Night Fighter (Royal Iraqi A.F.).

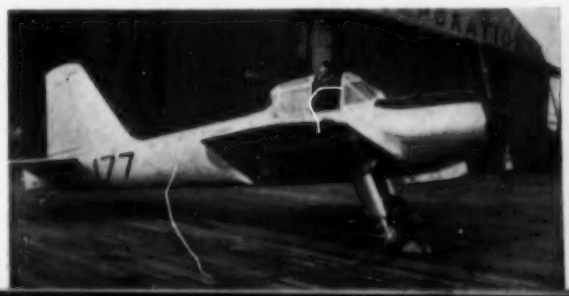
IRELAND

The Irish Air Corps

ORGANIZED FOR the primary purpose of training and maintaining fighter units for home defence, the Irish Air Corps is a

de Havilland Chipmunks (Irish Air Corps).

Hunting Percival Provost T.1 (Irish Air Corps).



Gloster Meteor F.8 (Israeli A.F.).

North American Harvards (Israeli A.F.).

North American F-51 Mustang (Israeli A.F.).

THE WORLD'S AIR FORCES . . .

component of the Defence Forces and is administered by the Department of Defence, located at Parkgate Street, Dublin. First-line units comprise a service unit, at Gormanston, Co. Meath, and a general purpose unit, responsible for reconnaissance, photography, target-towing and communications, at Baldonnel, Co. Dublin. The flying training school is at Baldonnel, and there, too, is an apprentice training school, an Air Corps depot, and a maintenance unit. No difficulty is experienced in maintaining the Corps at full establishment on a voluntary enlistment basis. Present strength is about 90 officers and 820 other ranks. The service unit is equipped with Supermarine Seafires, the general purpose unit with D.H. Doves, Avro Anson XIXs and Miles Martinets, and for training there are D.H. Chipmunks, Hunting Percival Provosts and Spitfire 9s. Officer Commanding, The Air Corps, is Col. P. Quinn, with headquarters at Baldonnel.

Vickers-Supermarine Spitfires (Israeli A.F.).

ISRAEL

The Israel Defence Forces/Air Force

THIS TITLE is the official style of Israel's Air Force, for it is a component arm of the Israel Defence Forces. It consists of various field/air units, and a headquarters, the latter functioning both as an H.Q. of units in the field and as a component of the General Staff of the I.D.F. The I.D.F./A.F. is organized in several fighter, fighter/bomber and transport squadrons, all stationed at operational bases and supported by maintenance bases, depots and training bases. The squadrons and their servicing units are trained to a high degree of mobility and, in case of emergency, the bases can accommodate squadrons operating different types of aircraft. They can, at the same time, send small servicing units to reactivate and maintain stand-by airfields and unused landing grounds.

Operational tasks are: (1) attainment of air superiority over potential aggressors; (2) co-operation with the ground and naval forces of the I.D.F. Standard fighters are the Gloster Meteor F.8, North American Mustang and Supermarine Spitfire. It was recently disclosed that an order has been placed for 15 Marcel Dassault Mystère II jet fighters. Standard bombers are the Boeing B-17 and D.H. Mosquito, and Douglas C-47s and Curtiss C-46s serve for transport. In the light reconnaissance class are the Piper Cub and Fokker S-11. Trainers are the Boeing PT-17 Kaydet, North American Harvard, Avro Anson and Airspeed Consul.

The aim of the Force is to attain a high pitch of operational efficiency through continual training of air and ground crews, and by the purchase of the most modern equipment available.

Principal commanders: A.O.C. I.D.F./A.F., Aloof (Brig. Gen.) Dan Tolkovsky; Director of Air, Aloof Mishneh (Col.) Shlomo Landau; Director of Personnel, Sgan Aloof (Lt-Col.) Aaron Medan; Director of Materials, Aloof Mishneh (Col.) Yehoshua Gilutz; Chief Engineer, Aloof Mishneh (Col.) Yehuda Rabim.

ITALY

The Italian Air Force

THE UNITS of this Force are grouped under the following headings, according to their tasks: operational; units for training flying personnel "who are not on the strength of any flying unit"; special task units; flying schools; and air/sea rescue centres. The operational formations are land/air warfare units and the Air Defence Command (*Commando Generale D.A.T.*), the latter responsible for control and reporting, the intercepter fighter units, the anti-aircraft artillery, both of the Army and Navy. The transport units include two or three squadrons of Fairchild C-119s, and the anti-submarine units are equipped

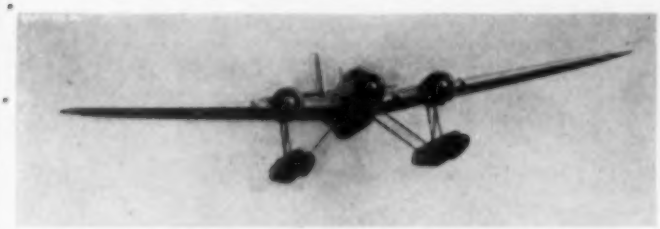
de Havilland Vampires (Italian A.F.).

Fiat G.80-1B prototype (Italian A.F.).

with Lockheed Harpoons. The transport and A.S. units have not yet attained the stature of commands.

There are six units concerned with the training of flying personnel "who are not on the strength of any operational formation." One is placed under each of the four air commands into which the Italian peninsula is divided, and there is, additionally, one in Sicily and one in Sardinia. The number and type of aircraft employed varies according to local requirements.

First of the special task units is an Air Staff Flying Unit, responsible for transporting V.I.P.s, for training flying personnel engaged on Air Staff duties, and for air survey. The second is the Experimental Flying Unit, charged with testing and assessing the performance of prototype aircraft and equipment, and thirdly there is a Helicopter Centre, fulfilling the tasks of training and rescue besides its operational commitments.



Cant Z.506B (Italian A.F.).

Fiat G.46-4 (Italian A.F.).

Piaggio P.148s (Italian A.F.).

(Below) Macchi M.B.308 (Italian A.F.).

Fiat G.59-4B (Italian A.F.).

Fiat G.59-4A (Italian A.F.).

On the instructional side there is the Flying Wing of the Aeronautical Academy (corresponding to the R.A.F. College), and the flying schools themselves. The training is divided into the customary three periods of tuition—elementary, basic and advanced. The first is accomplished with the Macchi 416 (Macchi-built Fokker S.11) and with the Piaggio P.148, and further involves 160 hr of flying on the North American T-6 for cadets of the Reserve and prospective N.C.O.s, though cadets of the Aeronautical Academy limit their training at this phase to 60 hours. Advanced training entails 60 hours of flying on Lockheed T-33s, and in addition the trainees put in 20 hr on operational types. This period of training takes place at the Jet Aircraft Training Centre. The training outlined above has an overall duration of about sixteen months, and the complete course at the Aeronautical Academy lasts four years, flying training being spread over the whole period. In addition to providing the training mentioned, the Jet Aircraft Training Centre is responsible for gunnery practice (through the School of Tactical Gunnery), the training of instructors (basic and advanced), and for all-weather operational training. There is, additionally, a Crew Training School for the instruction of transport aircrew.

The Air/Sea Rescue Centres are at Vigna di Valle (Lazio), Cagliari (Sardegna), Taranto (Puglie), Milan (Lombardia) and Augusta (Sicilia), the first three being equipped with Cant Z.506 three-engined floatplanes and Macchi P.136 twin-engined amphibians. The Milan centre has Fiat G.12 and G.212 landplanes, and the Augusta centre has Cant Z.506s. The various

North American Harvards (Italian A.F.).

(Below) Macchi M.146 (licence-built Fokker S.11) (Italian A.F.).

centres have subsidiary bases at Venice, La Spezia, Brindisi, Gallipoli, Olbia, Cagliari and Palermo, where there are aircraft and lifeboats.

The principal operational aircraft is at present the Republic F-84G fighter/bomber, but there are additionallly D.H. Vampire 5s and N.F.10s, and provision of North American F-86 Sabres is imminent. A small number of Mustangs remain, and the Air Staff Flying Unit is equipped with Dakotas and Beechcraft 17s.

It was announced some months ago that, under the terms of an agreement between the Italian Government and North American Aviation, Inc., F-86K single-seat all-weather fighters would be built at the Fiat plant. The first fifty machines would be manufactured entirely from parts supplied by North American. Italian-designed-and-built prototypes include the Fiat G.91 and the Aerfer Sagittario 2.

Future plans for the Air Force include gradual replacement of present equipment with machines of higher performance, re-equipment of air/sea rescue units with amphibian aircraft, expansion and development of the anti-submarine units into a coastal command, and expansion of transport units into a transport command.

Principal commanders: In command of the Land/Air Warfare Units is General Lalatta, and General Cavallarin is at the head of Air Defence Command.

Piaggio P.136-L (Italian A.F.).

Japanese-built Beechcraft Mentors (Japanese A.S.D.F.).

Lockheed T-33A and Curtiss C-46 Commando (Japanese A.S.D.F.).

North American T-6s (Japanese A.S.D.F.).

JAPAN

The Japanese Air Self-Defence Force

WE ARE officially informed that this Force, which was formed in July 1954, expects to have created one fighter wing of North American F-86 Sabres by the spring of next year. The number of aircraft involved, and the locations of their bases, have not yet been decided. All operational aircraft are expected to be defensive intercepters.

For the present, the training programme involves the successive employment of the Beechcraft T-34A Mentor, North American T-6 Texan, Lockheed T-33 Shooting Star, and North American F-86 Sabre. The flying schools are at Hamamatsu, Matsushima and Tsuiki.

As reported in *Flight* of April 1 this year (an issue which contained a detailed review of Japanese aircraft production), the Kawasaki Aircraft Company is assembling 150 Lockheed T-33As from Lockheed-built components, but subsequent machines will be entirely Kawasaki built.

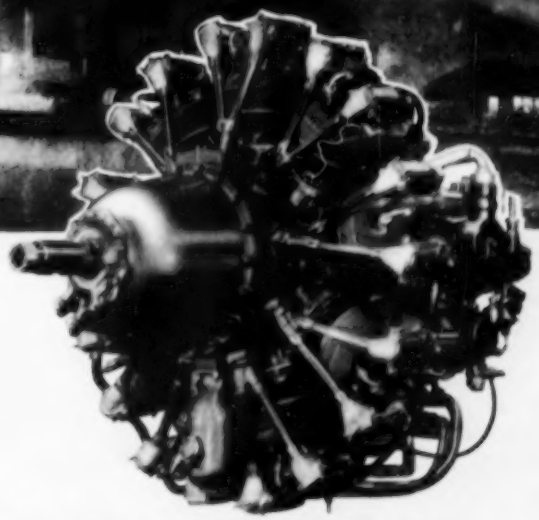
A company designated Mitsubishi Heavy Industries Reorganized, Ltd., is scheduled to manufacture the F-86 Sabre. Mention has been made of assembly of 70 F-86Fs before June 1957, 111 between July 1957 and June 1958, 214 between 1958 and 1959, and 200 between 1959 and 1961. All 595 aircraft would be for the Air Self-Defence Force. A close liaision has been established by Mitsubishi with the Sikorsky Division of the United Aircraft Corporation with a view to the manufacture of advanced types of helicopter.

The Japanese Maritime Self-Defence Force

FORTY-ONE aircraft have been loaned by the U.S. Navy to this Service. They include twelve SNJ trainers, seventeen PV2 Harpoon anti-submarine and patrol aircraft, two PBY Catalina patrol flying boats, and ten TBM Grumman Avenger torpedo/anti-submarine aircraft.

Grumman Avengers (Japanese A.S.D.F.).

Basic Power for the Royal Air Force



Powered by Alvis Leonides Engines these Hunting Percival Provosts were subjected to the most gruelling series of tests ever undertaken by an R.A.F. basic trainer. Flying at maximum intensity seven aircraft completed well over 1,000 hours in less than eight weeks—and since then the Leonides in squadron service has amply borne out the success of these early trials.

ALVIS LEONIDES

ALVIS LIMITED

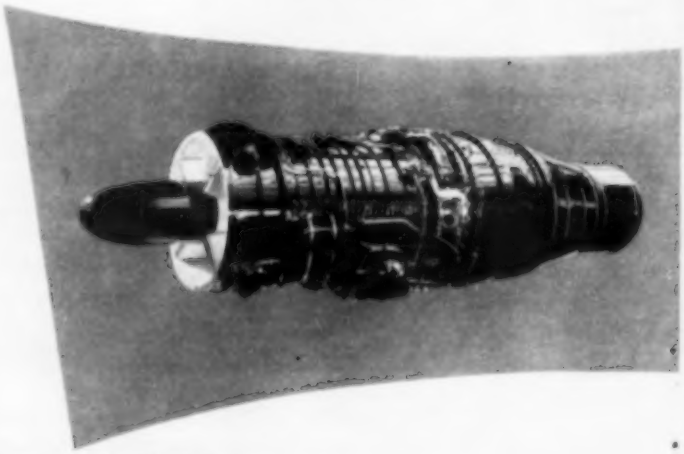
ALVIS

COVENTRY · ENGLAND

G

The Power of Armstrong Siddeley

The Sapphire turbojet is already celebrated as the power unit for some of the world's most powerful fighting aircraft on both sides of the Atlantic. Now it is chosen to power the French Vautour S.O. 4050-03 bomber—claimed as the first bomber in the world to reach Mach 1. This is further evidence of the strategic importance of the Sapphire—and the almost universal power of Armstrong Siddeley aero engines.

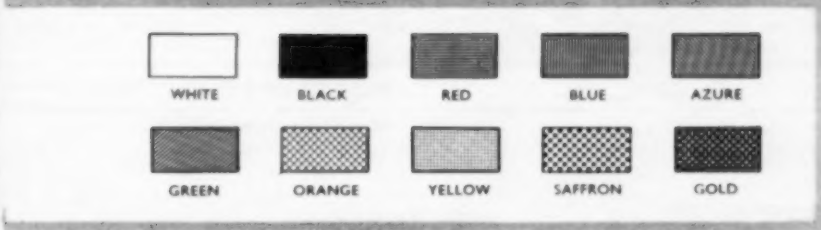


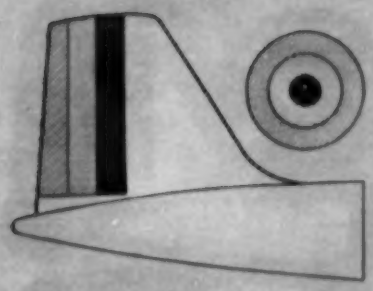
ARMSTRONG SIDDELEY MOTORS LIMITED

PARKSIDE · COVENTRY

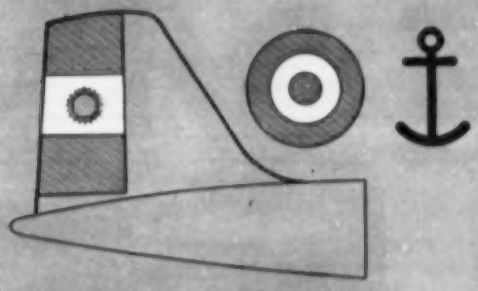
Members of the Hawker Siddeley Group

INSIGHNIA OF THE WORLD'S AIR FORCES

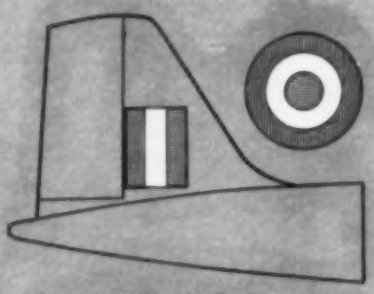




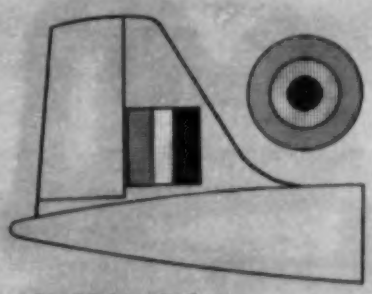
Royal Afghan Air Force.



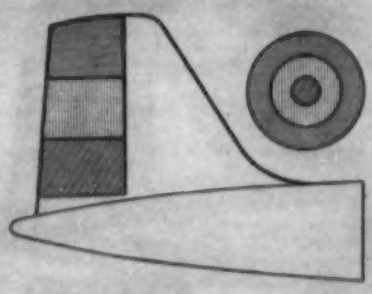
Argentine Air Force and Naval Aviation.



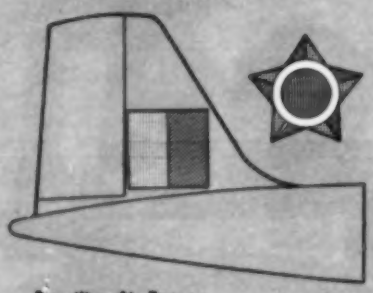
Royal Australian Air Force and Fleet Air Arm.



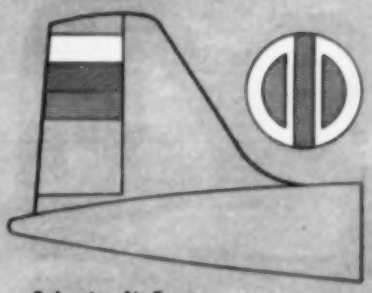
Royal Belgian Air Force.



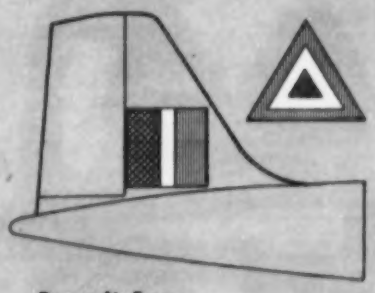
Bolivian Air Force.



Brazilian Air Force.

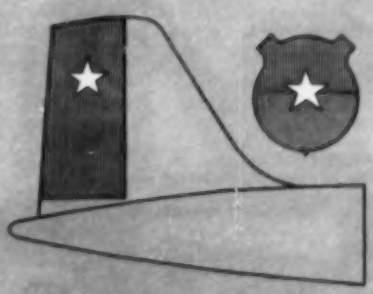


Bulgarian Air Force.



Burma Air Force.

Royal Canadian Air Force and Naval Aviation.

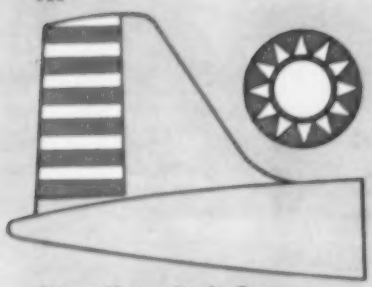


Chilean Air Force.

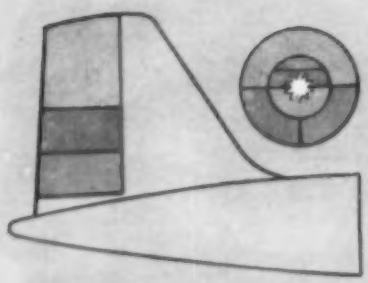
Royal Ceylon Air Force (wings and fuselage).

Chinese Air Force (People's Republic) (wings and fuselage).

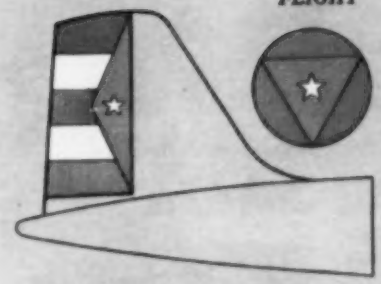
Insignia of the World's Air Forces



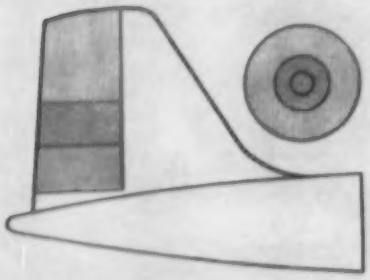
Chinese Nationalist Air Force.



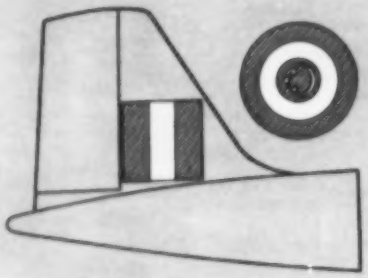
Colombian Air Force.



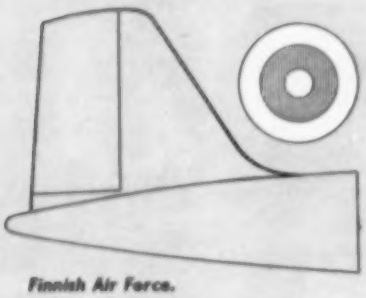
Cuban Air Force.



Ecuadorean Air Force.

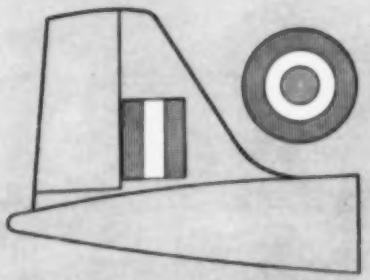


Egyptian Air Force.

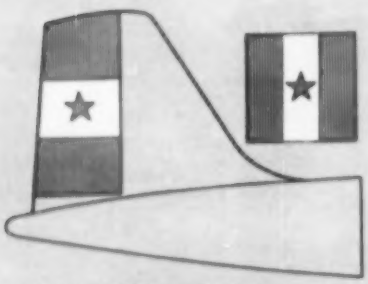


Finnish Air Force.

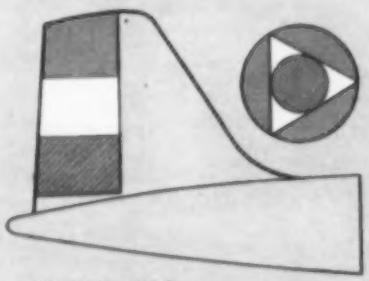
French Air Force and Naval Aviation (anchor superimposed for N.A.).



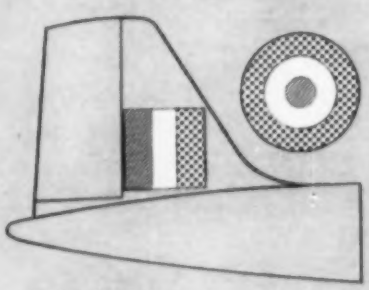
Royal Air Force and Fleet Air Arm.



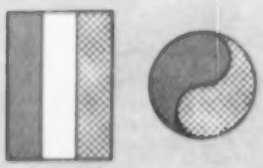
Honduras Military Air Arm.



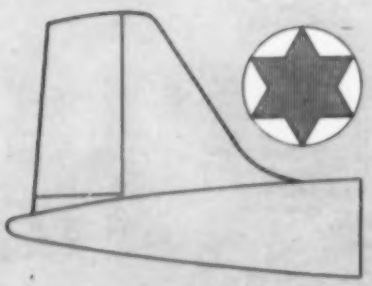
Hungarian Air Force.



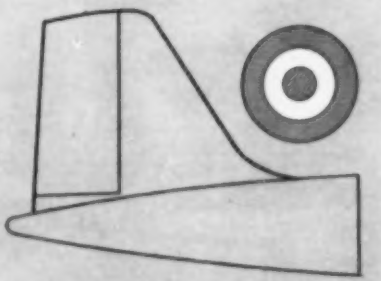
Indian Air Force.



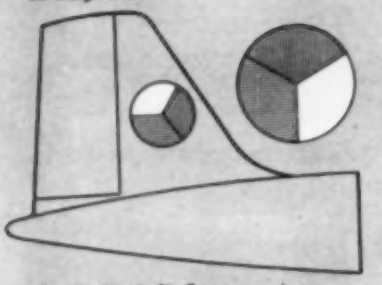
Irish Air Corps (flashes on wing under-surfaces; roundels on fuselage and wing upper-surfaces).



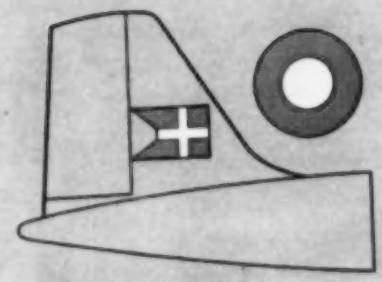
Israel Defence Forces Air Force.



Italian Air Force.

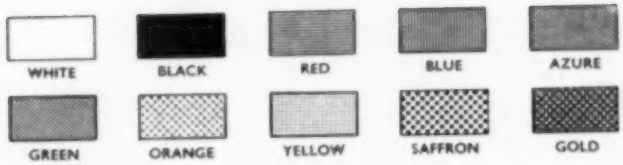


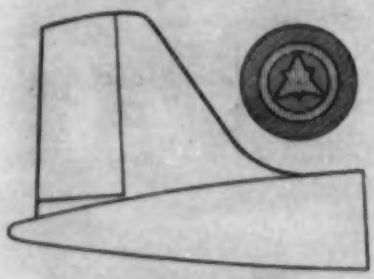
Czechoslovak Air Force.



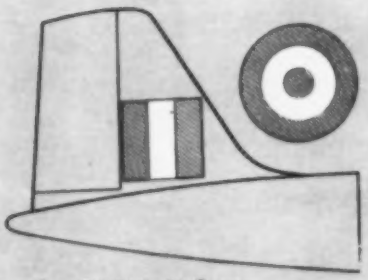
Royal Danish Air Force.

Dominican Air Force.

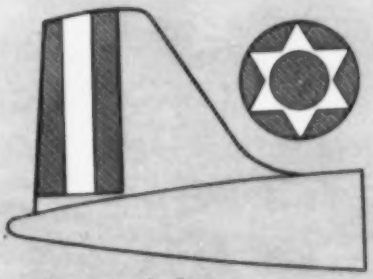




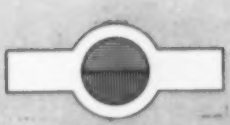
Imperial Ethiopian Air Force.



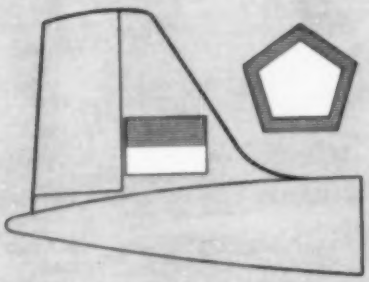
Royal Hellenic Air Force.



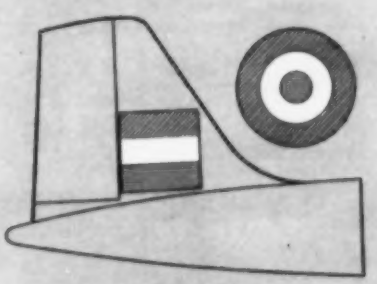
Guatemalan Air Force.



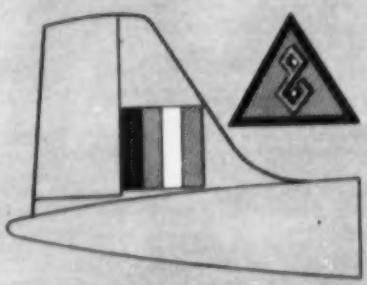
Haitian Air Corps (wings and fuselage).



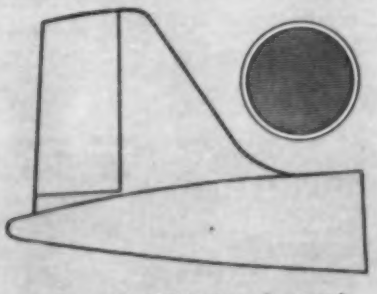
Indonesian Air Force.



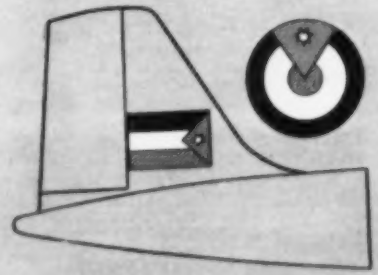
Imperial Iranian Air Force.



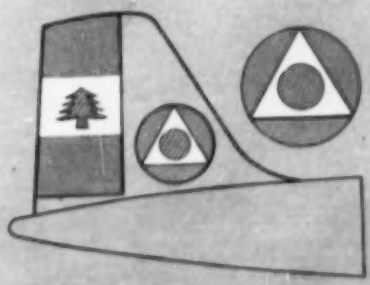
Royal Iraqi Air Force.



Japanese Air Self-Defence Force and Maritime S.D.F.

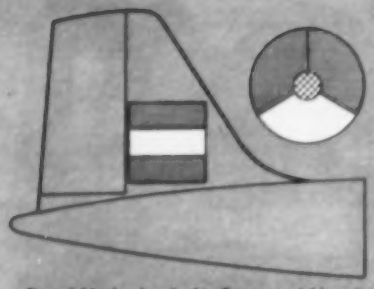


Jordan (Arab Legion Air Force).



Lebanese Air Force.

Mexican Air Force.

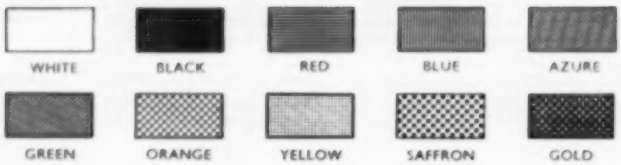


Royal Netherlands Air Force and Naval Air Service.

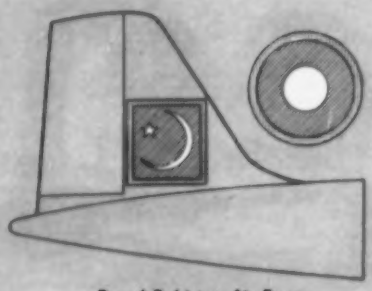
Royal New Zealand Air Force.

Nicaraguan Army Air Force.

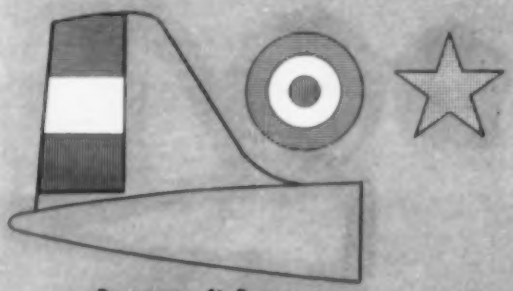
Insignia of the World's Air Forces . . .



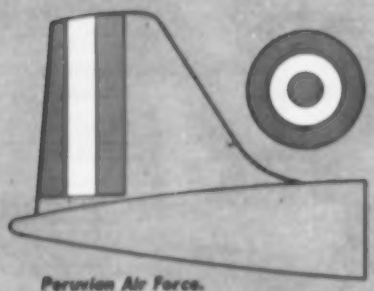
Royal Norwegian Air Force.



Royal Pakistan Air Force.

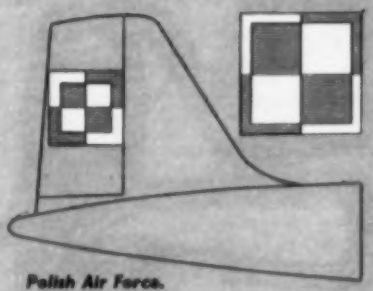


Paraguayan Air Force.

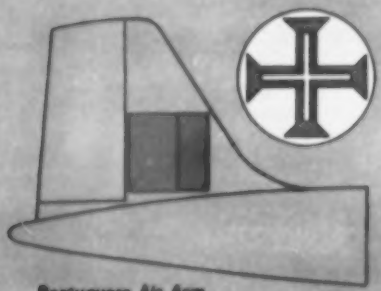


Peruvian Air Force.

Philippine Air Force (wings and fuselage).

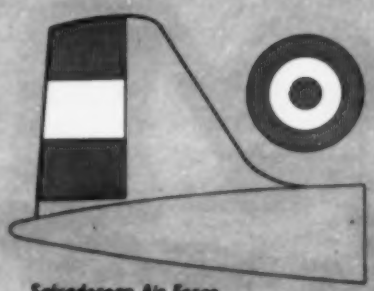


Polish Air Force.

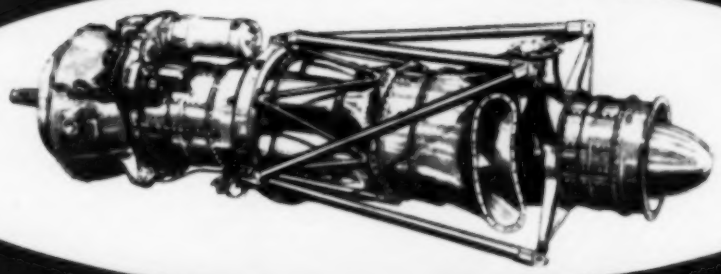


Portuguese Air Arm.

Rumanian Air Force.



Salvadorean Air Force.



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wherever you want it

Napier Eland turbo-props will give military helicopters the power to move heavy loads up **fast** *to the fighting areas—and put them down wherever they're needed. Power for vertical lift or descent is taken through an auxiliary compressor (in the form of compressed air to the rotor blade tips) and for forward flight through the propellers. One example of a military helicopter to be powered by Elands is the Fairey Rotodyne, which will carry loads of the order of 40 troops and their equipment, or a 3-ton Army lorry, or a jeep and 25 pdr. gun.*

NAPIER *Eland turbo-prop*

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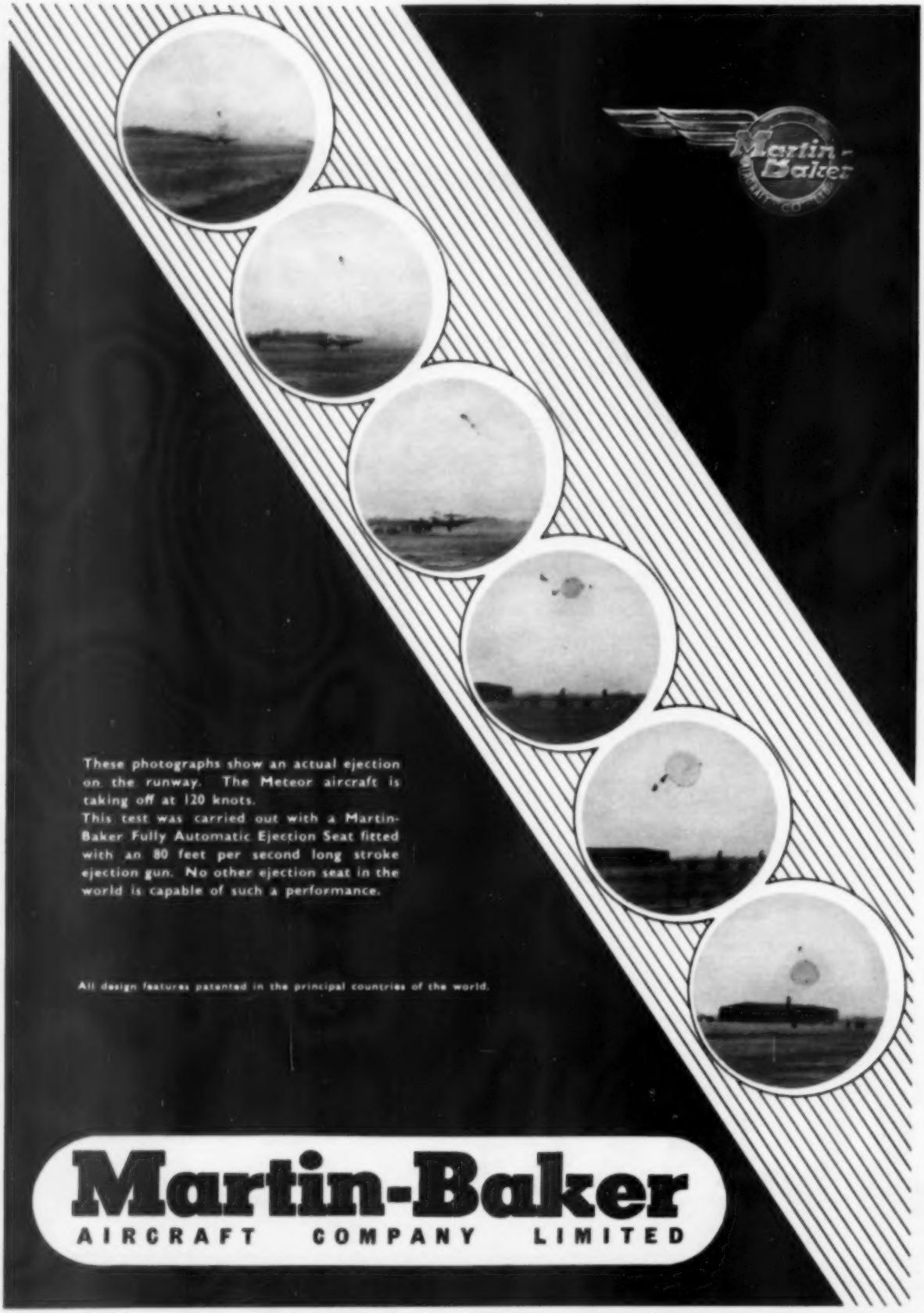
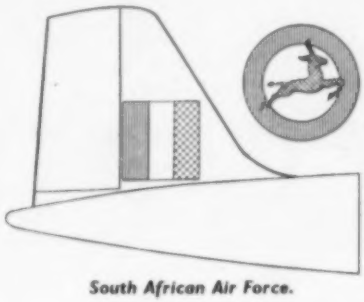


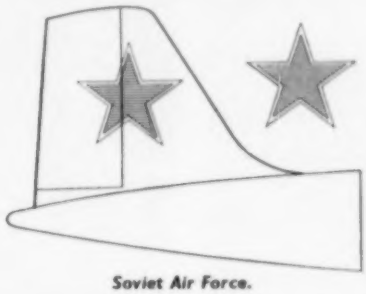
These photographs show an actual ejection on the runway. The Meteor aircraft is taking off at 120 knots.
This test was carried out with a Martin-Baker Fully Automatic Ejection Seat fitted with an 80 feet per second long stroke ejection gun. No other ejection seat in the world is capable of such a performance.

All design features patented in the principal countries of the world.

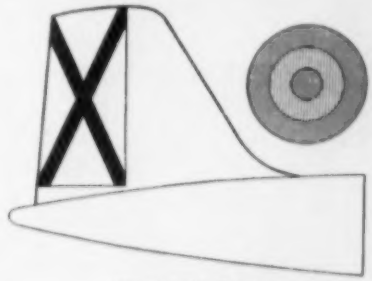
Martin-Baker
AIRCRAFT COMPANY LIMITED



South African Air Force.

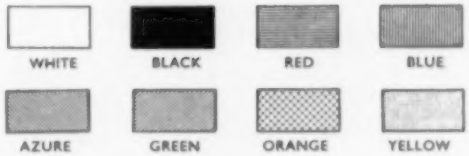


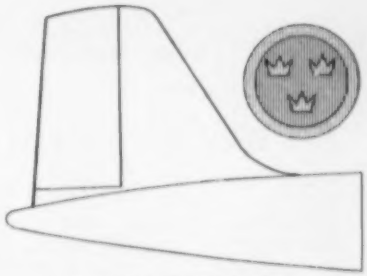
Soviet Air Force.



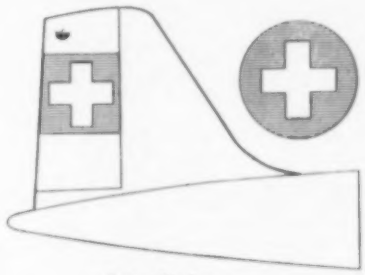
Spanish Air Force.

Insignia of the World's Air Forces . . .

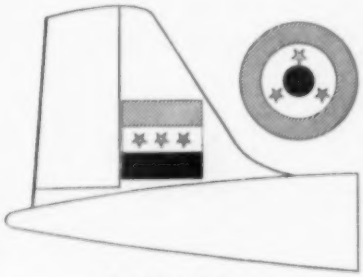




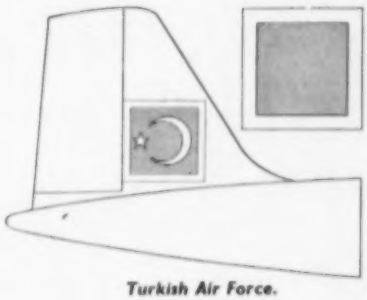
Royal Swedish Air Force.



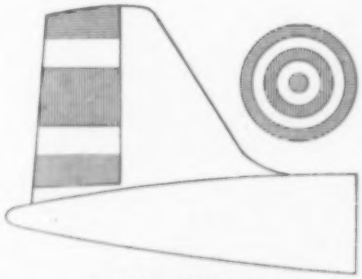
Swiss Air Force.



Syrian Air Force.

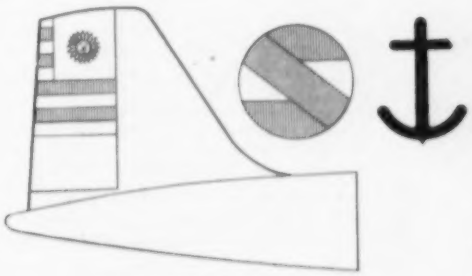


Turkish Air Force.

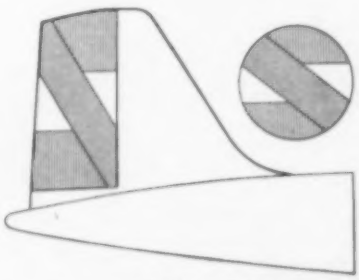


Royal Thai Air Force.

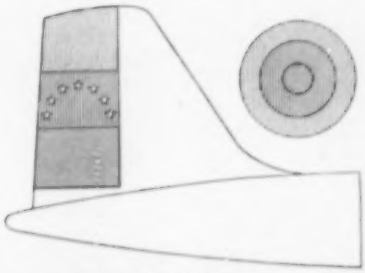
United States Air Force and Navy
(*wings and fuselage*).



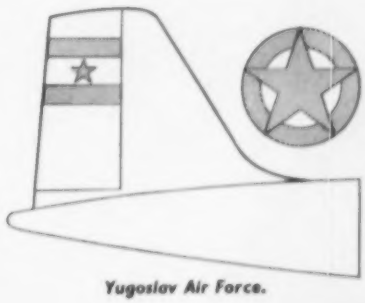
Uruguayan Naval Aviation.



Uruguayan Military Aviation.



Venezuelan Air Force.



Yugoslav Air Force.

Auster Autocrat (Arab Legion A.F.).

D.H. Dove (Arab Legion A.F.) over the ruined Roman city of Jerash.

THE WORLD'S AIR FORCES . . .

JORDAN

The Arab Legion Air Force

FORMED IN 1949 as an integral unit of the Arab Legion, the Arab Legion Air Force remains as such today. Its organization is based on the R.A.F. system, though the Force itself is at present relatively small, consisting of a single station at Amman, which comprises administrative, flying and technical wings. The admin. wing has no sub-divisions and is under the direct control of the Officer Commanding the Air Force. The flying wing, however, is sub-divided into transport, Air O.P. and training flights. Similarly, the technical wing is sub-divided into the primary servicing flight, the repair and inspection flight, the equipment section, etc.

The Air Force is responsible for transporting personnel and freight within Jordan itself and to neighbouring countries, and undertakes freighting flights to and from the United Kingdom. It serves, too, for internal communications, artillery spotting and army co-operation for military exercises, and for photographic reconnaissance (likewise for military exercises).

Aircraft employed for transport and supply operations are Vickers-Armstrongs Viking 1B, Handley Page (Reading) Marathon IA, and de Havilland Dove. The D.H. Rapide serves as a light communications, desert rescue and photographic aircraft, and the Auster 6 is used as an Air O.P., army co-operation and photographic machine. Standard trainers are the Auster Aiglet and Autocrat, and D.H. Chipmunk and Tiger Moth. Now that a sound nucleus of pilots and ground personnel has been established, expansion heads the programme.

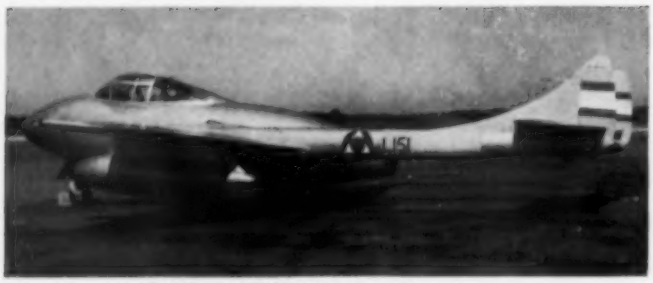
Principal commanders: Officer Commanding Arab Legion Air Force. W/C. J. Dalgleish, R.A.F. (accorded rank of Lt-Col., Arab Legion); Chief Technical Officer, S/L. J. R. Clapham (accorded rank of Major, Arab Legion); Officer Commanding Flying Wing, S/L. R. T. Saunders (accorded rank of Major, Arab Legion).

KOREA

The North Korean Air Force

FIGHTERS AND light tactical bombers of Soviet construction (Mig-15s and Il-28s) continue to form the backbone of this Air Force.

Tail of D.H. Dove and D.H. Chipmunks of the Lebanese A.F.



D.H. Vampire T.55 (Lebanese A.F.).

The South Korean Air Force

IN PLACE of North American F-51D Mustangs this Force is scheduled to receive 75 F-86F Sabres, the pilots for which are being trained in the U.S.A. A complete wing of Sabres should be operational next year. C-in-C. is General Kim Chung Yul.

LEBANON

The Lebanese Air Force

THE AIRFIELDS used by this youthful force are principally those established by the French Air Force during France's mandate. Among the earliest aircraft acquired (in 1949) were Percival Prentices; more recently de Havilland Chipmunks, Doves and Vampire Trainers have been supplied.

MEXICO

The Mexican Air Force

PEACE-TIME duties of this Air Force are listed as flying training; administrative and logistic flying; transport and training of parachutists; transport of casualties to central hospitals; co-operation in finding and rescuing crashed aircraft; and assistance at such disasters as earthquakes, floods, cyclones and other catastrophes. Future plans include "salvage, and tactical training for jet aircraft." There will be an expansion, too, in personnel. Standard aircraft are the Republic P-47 for ground support, Douglas A-24 Dauntless for dive bombing, North American B-25 for light bombing, Sikorsky OS2U Kingfisher for observation, Douglas Dakota for transport, Stearman PT-17 Kaydet and Fairchild PT-19 Cornell for primary training, Vultee BT-13 and 15 Valiant for basic training, Beechcraft AT-7 for navigation training, Beechcraft AT-11 for bombing training, Beechcraft F-2 for air photography, and Stinson L-5E for liaison.

Principal commanders: General Brigadier Piloto Aviador Alberto H. Vieytez y Vieytez, Chief of the Mex.A.F.; General Brigadier Piloto Aviador Roberto Salido Beltran, Assistant Chief of the Mex.A.F.; General Brigadier Piloto Aviador Rafael J. Suarez Peralta, Inspector General; Teniente Coronel Piloto Aviador Marcos Ramirez Castañeda, Assistant Chief of the Air Staff.

Republic P-47 Thunderbolts (Mexican A.F.).
(Below) Mexican A.F. parachutists with AT-11s and Dakota

Gloster Meteor F.8s (Royal Netherlands A.F.).

Republic F-84G Thunderjet (Royal Netherlands A.F.).

Fokker S.11 Instructors (Royal Netherlands A.F.).

Fokker S.14 Mach Trainer (Royal Netherlands A.F.).

THE NETHERLANDS

The Royal Netherlands Air Force

CONSTITUENT COMMANDS of this Air Force are: Air Defence Command, Training Command, a Regiment Command (*Luchtvaarttruppen*), and Depots and Workshops Command. There is, in addition, a tactical component (under the operational control AIRCENT of NATO) which forms part of No. 2 Group, R.A.F., within 2nd A.T.A.F.

Air Defence Command has the task of air defence of Holland and for this purpose is equipped with Dutch-built Meteor F.8s and British-built Meteor N.F.11s. Its bases are at Leeuwarden, Twente and Soesterberg. The tactical squadrons, equipped with Republic F-84G Thunderjets, are based at Volkel and Eindhoven.

The Regiment Command is responsible for the military training and operational employment of airfield defence troops, while the Depots and Workshops Command deals with aircraft maintenance. All major repairs and overhauls are completed by contractors outside the air force.

Training Command deals with both flying and ground personnel, and for this purpose there are two main bases, at Gilze-Rijen and Woensdrecht. Officers for the Royal Netherlands Air Force are at present trained at the Royal Military Academy at Breda, which is equivalent to our own R.M.A. Sandhurst, but it is planned that a separate air force officers' academy should be set up in the near future. Training aircraft are Fokker S-11s (basic), T-6 Harvards (advanced) and, this year, the first Fokker S-14 Mach Trainers are to be introduced. The operational commands also have Meteor T.7s and Lockheed T-33s for instrument and continuation training. Dutch Naval Air Arm crews are trained up to "wings" standard with the Air Force at Woensdrecht. Technical ground training for the Air Force alone takes place at Deelen.

The Dutch Air Forces Organization is closely tied in with NATO requirements and commitments, and the principal post-war build-up of strength for this purpose was planned at the 1952 NATO conference at Lisbon. The fulfilment of the programme laid down then, however, was postponed from the end of 1954 until the end of 1955. By that time, it is foreseen, there will be six day-fighter squadrons, three all-weather fighter squadrons, six tactical squadrons, a transport squadron and one reconnaissance squadron. To conform with this plan, some new bases are under construction, including Ypenburg (the extension of which is almost completed), Venray and Deek.

North American Harvards (Royal Netherlands A.F.).

For some years the Fokker Company in Holland and the Fabrique Nationale in Belgium have been jointly producing Meteors, an arrangement which is to be continued this year with the production of a considerable number of Hawker Hunter F.4s and F.6s. In addition, the F-84Gs will, during the year, begin to be replaced by swept-wing F-84Fs, RF-84Gs by RF-84Fs, and a number of American-built F-86K single-seat all-weather fighters (probably 56) will follow in due course.

There has been some doubt as to the type of all-weather equipment which should be adopted and this must be related to the type of ground control and reporting equipment available. A good deal of Dutch radar equipment dated back to 1945 and it is now intended that this should be scrapped and replaced. If the F-86K is introduced as standard it is likely that American early-warning radar will follow.

Since the Royal Netherlands A.F. is, to a large extent, integrated with NATO, it should be considered in conjunction with 2nd A.T.A.F. and with the Belgian Air Force. Its tactical units are, for this reason, part of No. 2 Group and its air defence units are combined in the Dutch-Belgian No. 69 Group.

The NATO Technical Air Defence Research Centre, an organization staffed by many of the member nations, is located in Holland and has the task of speeding up the procedures of air defence. In addition, Dutch scientists are engaged in studying the possibility of combining with the analogous Norwegian organization for joint production of guided missiles.

Prince Bernhard of the Netherlands is Inspector General of the Dutch Armed Forces.

Principal commanders: Chief of the Air Staff, Lt. Gen. A. Baretta; Deputy Chief of the Air Staff, Maj-Gen. H. Schaper; Vice-Chief of the Air Staff, Col. W. den Toom; Chief Signals Officer, Cdre. L. M. Kamp; Director-General of Equipment, Maj-Gen. W. J. Reijnierse; Air Defence Command, Cdre. A. J. de Vries; Training Command, Cdre. B. J. Flodeldij; Regiment Command (*Luchtvaarttruppen*), Lt-Col. P. J. Maters; Depots and Workshops Command, Col. A. S. Westra. The

Hawker Sea Fury F.B.51s (Royal Netherlands Naval Air Service).

THE WORLD'S AIR FORCES . . .

Fairey Firefly 5 (Royal Netherlands Naval Air Service).

Sikorsky S-55 (Royal Netherlands Naval Air Service).

Convair Catalina (Royal Netherlands Naval Air Service).

Woensdrecht training base is commanded by a naval officer, Cdr. W. Bierenbroodspot.

The Netherlands Army

IT HAS recently been reported that the Netherlands Army will receive in the near future some fixed-wing aircraft and helicopters, the former to be de Havilland Canada Beavers and Piper Super Cubs. They will be flown by pilots of the Netherlands Air Force, which Service will also be responsible for overhaul. The Netherlands Army, however, will use the machines operationally.

In Netherlands New Guinea two Beavers, with wheels and floats, are flying with the new airline company Kroonduif, operated jointly by K.L.M. and the Netherlands Government. Three ex-K.L.M. Dakotas are also flying for this company.

The Royal Netherlands Naval Air Service

THE ORGANIZATION of this Service is based on NATO, overseas, and home commitments. For NATO there is one aircraft carrier with two air groups, each group consisting at present of one squadron of Hawker Sea Furies and one squadron of Grumman Avengers, and two shore-based maritime squadrons, with Lockheed Neptune P2V-5s. Overseas, in Netherlands New Guinea, the R.N.N.A.S. operates one squadron of PBY-5A Catalina amphibians, and based in the West Indies, on the island of Curaçao, is a squadron of Harpoons. In Home Command, operating from R.N.N.A.S. Valkenburg, are one training squadron, consisting of Fairey Firefly trainers and Beechcrafts, and one air/sea rescue squadron, equipped with PBY-5A Catalinas and Sikorsky S-55 helicopters. When the carrier H.Nth.M.S. *Karel Doorman* is at sea, part of the helicopter flight is embarked. Illustrative of the work of this unit is the taking off of sixteen crew members from the Norwegian tanker *Gatt* on January 13th this year. A gale had stranded the vessel on a pier at the Hook of Holland and the occasion was the first in the turbulent history of the Dutch coast in which such a rescue had been accomplished.

The R.N.N.A.S. defines its operational tasks as convoy and anti-submarine duties with NATO; reconnaissance and anti-submarine work overseas; and—at home—operational training on single-engined aircraft, conversion on to twin-engined aircraft, and training of observers, navigators and telegraphists. Pilot-training is a co-operative undertaking with the Royal Netherlands Air Force. Air/sea rescue is listed as the third operational task.

Future plans include the modernization of the *Karel Doorman*, to begin shortly and to include an angled deck and a steam catapult. The Sea Furies will be replaced by unspecified jet aircraft, Catalinas will be replaced by Martin Mariners, and an additional shore-based maritime squadron, equipped with Neptune P2V-7s, will be formed.

Principal commanders: Deputy Chief of Naval Staff (Air), Cdre. J. M. van Olm; C.O., R.N.N.A.S. (Home), Capt. Jhr. P. J. Elias; C.O., R.N.N.A.S. Valkenburg, Capt. A. W. Witholt.

Lockheed P2V-5 Neptune (Royal Netherlands Naval Air Service).

NEW ZEALAND

The Royal New Zealand Air Force

COMPOSED OF the Regular Air Force, the Territorial Air Force, the Air Force Reserve, the Air Training Corps and the Women's Royal New Zealand Air Force, the R.N.Z.A.F. is administered by the Air Board. Command is exercised by the Air Officer Commanding R.N.Z.A.F., who is also Chief of the Air Staff. Headquarters are in Wellington, and a Task Force Administrative Headquarters and Inspectorate General are established in the Auckland area. There are nine stations in New Zealand, including two stores depots and a headquarters unit, and one in Fiji.

The role of the R.N.Z.A.F. is to provide forces for the defence of New Zealand and her island and trust territories; for the defence of sea communications; and for deployment overseas in support of the United Nations, and to meet New Zealand's obligations under arrangements with the Commonwealth and allies. To those ends it is organized to provide a force which would be immediately available for emergency expansion. Peace-time duties include the provision of overseas garrison forces; military air transport; and the training of regular and non-regular units. A search-and-rescue organization is maintained in New Zealand and in the South Pacific area.

Until recently based in Cyprus, No. 14 Squadron (fighter/ground attack) is now in Singapore, with D.H. Venoms. No. 75 Squadron, with Vampires, is training at Ohakea, and has provided replacements for tour-expired members of No. 14 Squadron. Up to December last year No. 41 Squadron, with Handley Page Hastings and Bristol Freighter aircraft, maintained a regular service between New Zealand, Cyprus and the United Kingdom, and a regular service to Japan, in support of K-Force. Last year also it transported much military equipment from New Zealand to Tonga. In December the squadron handed over its Hastings to the re-established No. 40 Squadron, now responsible for long-range transport. No. 41 is now a medium-range unit, with Bristol Freighters. No. 42 Squadron with D.H. Devons and other types, provides internal communications and undertakes multi-engine conversion training and target-towing. No. 5 (Maritime) Squadron, in Fiji, has been re-equipped with Short Sunderlands, flown out from the United Kingdom by New Zealand crews; it trains in its appropriate role and at the same time provides air/sea rescue services in the Fiji area. No. 6 (Maritime) Squadron—a Territorial unit with a regular nucleus—has also been re-equipped with Sunderlands and has a similar role to that of No. 5.

Non-regular units consist of four fighter/attack squadrons of the Territorial Air Force, recruited in the four main centres and at present with Mustangs, though soon to be re-equipped with Vampires; the Territorial maritime squadron (No. 6) recruited in the Auckland area; and the following Task Force Ancillary Units: two light anti-aircraft squadrons; air stores park; fuel and ammunition park; mechanical transport light repair unit; repair and salvage unit; mobile field hospital; casualty air evacuation section. Air defence units, established on a territorial basis, are being raised for the control of defence in the areas of Auckland, Wellington and Christchurch. A fourth, in the Auckland area, is for emergency deployment in Fiji.

Flying training is co-ordinated by a Flying Training Wing H.Q. at Wigram; there, too, are the Flying Training School, for training pilots up to wings standard; the Air Navigation and Air Signals School; and the Central Flying School, for training instructors and to provide refresher courses. Initial training of regular and non-regular aircrew is given at the Initial Training School at Taieri, where all pilots are graded for further training. Thence selected pilots pass on to the F.T.S., while others receive additional training at aero clubs. Trade training is undertaken at Hobsonville, Wigram, Whenuapai, Woodbourne, Taieri and Ohakea.

Under the compulsory military training scheme, to meet mobilization requirements, young men are selected to train as pilots and ground staff. Pilots receive further flying at aero clubs, over a period of three years, airmen in ground trades, after initial training, undergo three annual periods of training, either on a station or as members of a Task Force Ancillary Unit. University students can qualify for commissions in the Territorial Air Force after initial compulsory military training, and further periods of training with the Regular Air Force during their long vacations. Women are enlisted in certain trades in a territorial section of the W.R.N.Z.A.F. The Air Training Corps provides a valuable source of recruits, and annual flying scholarships provide aero-club training for selected cadets.

The strength of the R.N.Z.A.F. as at March 31st, 1954, was: Regular Air Force, 4,245; W.R.N.Z.A.F., 446; Territorial Air Force, 405; Territorial Air Force (Supplement), 2,548; Active Reserve, 4,023; General Reserve, 5,756. Total expenditure for the year ended March 31st, 1954, was £10,326,960; the comparable figure for 1952/53 was £8,386,103.

Principal commanders: A.O.C. R.N.Z.A.F. and Chief of the Air Staff, A.V-M. W. H. Merton; A.O.C. R.N.Z.A.F. Headquarters, London, A. Cdre. M. F. Calder; A.O.C. Task Force Administrative Headquarters and Inspector General of the R.N.Z.A.F., A. Cdre. R. J. Cohen.

D.H. Vampires of No. 75 Squadron (R.N.Z.A.F.).

Short Sunderland 5s of No. 5 (Maritime) Squadron, R.N.Z.A.F.

Troops boarding a Handley Page Hastings of No. 41 (Transport) Squadron, R.N.Z.A.F.

Douglas Dakota of No. 42 (Communications) Squadron, R.N.Z.A.F.

Bristol Type 170 Mk 31 (R.N.Z.A.F.).

de Havilland Devons (R.N.Z.A.F.).

Republic F-84 Thunderjets (Royal Norwegian A.F.).

Douglas Dakota (Royal Norwegian A.F.).

THE WORLD'S AIR FORCES . . .

NICARAGUA

The Nicaraguan Army Air Force

NO INFORMATION is forthcoming from the Nicaraguan authorities on the composition and equipment of their national Army Air Force. In post-war years Lockheed P-38 fighters and Boeing B-29 Superfortress bombers were acquired, in addition to Douglas Dakotas for transport and three types of American trainer, the North American AT-6, Boeing PT-13 and Fairchild PT-19.

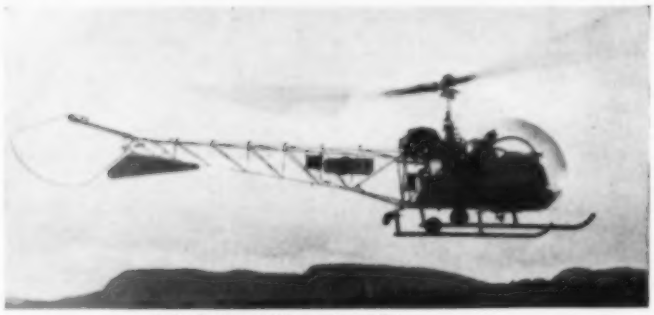
NORWAY

The Royal Norwegian Air Force

KNOWN BY the British contraction R.No.A.F., this Service is divided into four Air Command areas, the commanders of which are responsible to the Commander-in-Chief through Headquarters, R.No.A.F. Directly responsible to the C-in-C. also are the Air Commander, Norway; the Director of Material Command and Depot; the Inspector General; the Inspector for Airfield Defence; and the Air Surgeon General. Squadrons and air-defence components are controlled by the C-in-C. through Air Commander, Norway, who himself exercises control through sector operations centres. There are eleven squadrons, of which eight are fighter and fighter/bomber units.

Primary role of the Force is air defence, but the organization also provides for tactical support of land and naval forces. Pending the arrival of North American F-86K single-seat all-weather fighters, the fastest machines in service are the Republic F-84G and E Thunderjet—the "G" for interception and ground support and the "E" for photographic reconnaissance. The Lockheed T-33A is the standard jet advanced trainer; initial trainers are the Fairchild PT-19 and Fairchild PT-26. The Catalina PB5Y-A serves for maritime duties, and Bell 47D1 and G helicopters for air/sea rescue. For transport there are Douglas C-47s and for communications de Havilland Canada Otters and Noorduyn Norseman Mks 4 and 6 on wheels, skis or floats.

Principal commanders: C-in-C. Lt-Gen. F. Lambrechts; Air Commander, Norway, Maj-Gen. B. F. Motzfeldt; Chief of Staff, Maj-Gen. E. Tufte Johnsen.



Bell 47 (Royal Norwegian A.F.).

Fairchild PT-19 Cornell (Royal Norwegian A.F.).

PAKISTAN

The Royal Pakistan Air Force

IN SEPTEMBER 1947, shortly after this Air Force came into being, a flying training school was established at Risalpur and this has since become a college. Two ordinary schools, run on the lines of English public schools, were subsequently set up, and in the creation and operation of these the R.P.A.F. have been assisted by Air Service Training, Ltd. Future officers and technicians for the Service are selected from the young students, and boys in other schools in the country are provided with the opportunity to join the Shaheen Air Training Corps, thus providing them with an entry into aeronautical activities. University air squadrons have also been organized, where flying training is given on Tiger Moths and Auster Aiglets. Training at Risalpur takes place on Harvards, and the full course lasts three years. Successful candidates pass on to Mauripur for conversion on to operational types of aircraft. Technicians are trained at the R.P.A.F. Apprentices' Training School at Jorangi Creek (Karachi). Besides training its own personnel, Pakistan sends a considerable number of cadets to the United Kingdom, Australia and the United States, both for aircrew and for technical training, and some of them have won high awards during their stay.

The most modern Pakistani fighters are Vickers-Supermarine Attackers. Hawker Fury fighter/bombers are also in service, as are Bristol Freighters for transport and Halifaxes for bombing.

In succession to A.V-M. L. W. Cannon, A.V-M. A. W. B. Mcdonald has been designated as C-in-C., Royal Pakistan Air Force.

Vickers-Supermarine Attackers (Royal Pakistan A.F.).

Hawker Furies (Royal Pakistan A.F.).

PARAGUAY

The Paraguayan Air Force

THIS FORCE is thought to consist mainly of American-built light transport and training aircraft, the former being Beechcrafts. Among the trainers are North American Harvards, Boeing PT-17s and Fairchild PT-19s.

PERU

The Peruvian Air Force

UNDER THE Mutual Defence Assistance Programme the Peruvian Air Force has received within recent months eight Douglas B-26 Invader attack bombers. Previous types in service were Curtiss Hawk and Republic Thunderbolt fighters, North American Mitchell and Lockheed Ventura bombers, Douglas Dakota, D.H. Rapide and Grumman Goose transports, Convair Catalina general-purpose amphibians, and the following trainers: North American Harvard, Boeing PT-13, Fairchild PT-19, Vultee BT-13, Beechcraft AT-11 and Cessna AT-17. The Air Force is administered by the *Ministerio de Aeronautica*, established in Lima, and is responsible for both military and naval aviation.

THE PHILIPPINE REPUBLIC

The Philippine Air Force

A SQUADRON of North American F-51 Mustang fighters is on the strength of this Force, in addition to Douglas Dakota transport aircraft, Piper L-4s and Stinson L-5s for liaison and observation, and Harvard, Cornell and Temco Buckaroo trainers. In conjunction with the Institute of Science and Technology, at Manila, the Air Force is developing two types of light aircraft —the XL-14 Maya, built to test the practicability of utilizing plywood, bamboo and other local woods in aircraft construction, and the XL-15, a twin-boom single-engined ambulance machine.

POLAND

The Polish Air Force

THE FIRST-LINE elements of the Polish Air Force are mainly equipped with Mig-15 and 15*bis* jet fighters and Il-28 twin-jet bombers. Training types include the UT-2, Yak-9, Yak-11 and Yak-18. In April 1953 an escaped Polish pilot said that a number of Russian officers were in charge of various units of the Service, and that approximately 120 jet aircraft, of a total operational strength of 300 aircraft, were operating. He believed that at the time the Russians had some 200 aircraft of their own—all jets —in the Pomeranian and Silesian areas of Western Poland. Commander-in-Chief is General Jan Turkiel.

PORTUGAL

The Portuguese Air Force

TWO OPERATIONAL squadrons are contributed by this Force to NATO. The principal type is the Republic F-84 Thunderjet, but a few F-47 Thunderbolts, Hawker Hurricanes and Supermarine Spitfires remain in service. Elements of Portuguese Thunderjets have participated successfully in Central European exercises, integrated with units of the French Air Force. The standard trainer is the D.H. Chipmunk, now being built domestically by O.G.M.A. (Officinas Gerais de Material Aeronautico). Lockheed Harpoons may be acquired for maritime work.

RHODESIA

The Royal Rhodesian Air Force

THE ABOVE title was conferred upon the former Southern Rhodesia Air Force in October last year. Simultaneously the R.R.A.F. adopted R.A.F. ranks in place of the army ranks formerly used. The principal airfield is New Sarum, otherwise known as Kentucky Farm, where the senior air command is held by A. Cdre. E. W. S. Jacklin. The first task of the R.R.A.F. is to train and hold in readiness two ground-attack squadrons. One squadron is using Vampire F.B.9s and a second is working up on Vampire T.11s. In emergency, and after re-equipment, these squadrons would expect to operate with the R.A.F. Photographic reconnaissance, transport support and "flying doctor" operations are all the concern of the R.R.A.F. Types in service, in addition to the Vampires, are Hunting Percival Provosts, Armed Provosts and Pembroke C.1s, Dakotas, Harvards, Ansons, Rapides and Tiger Moths. Air-observation pilots for the Army are trained by R.R.A.F. pilots on Austers.

de Havilland Vampire F.B.9s (Royal Rhodesian A.F.).

XL-14 Maya, built in conjunction with Philippine A.F.

Mig-15bis (Polish A.F.).

Republic F-84 Thunderjet (Portuguese A.F.).

de Havilland Chipmunk (Portuguese A.F.).

(Below) Hunting Percival Pembroke C.1 (Royal Rhodesian A.F.).

Salvadorean A.F. representatives taking delivery of a Beechcraft T-34.

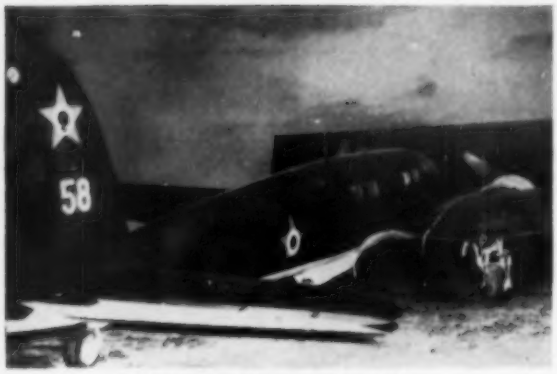
de Havilland Vampire F.B.5 (South African A.F.).

Short Sunderland 5 (South African A.F.).

Lockheed Ventura PV-1 (South African A.F.).

Douglas Dakota (South African A.F.).

(Below) D.H. Devon (South African A.F.).



Heinkel He 111 (Rumanian A.F.).

THE WORLD'S AIR FORCES . . .

RUMANIA

The Rumanian Air Force

SOVIET TYPES, including, in all probability, Yak-23 single-jet fighters, are serving as the first-line equipment of this Air Force. Earlier types included Messerschmitt Me 109Gs, Heinkel He 111s, Junkers Ju 52 transports, Fieseler Storch liaison aircraft and Focke-Wulf Fw 58 trainers, all of German origin, and I.A.R. 80 fighters and I.A.R. 39 reconnaissance machines, constructed in Rumania, Savoia Marchetti S.M.79s and Nardi F.N.305s (Italian), and a few American Fleet 10G trainers.

SALVADOR

The Salvadorean Air Force

THE LATEST equipment known to have been acquired by this arm is a quantity of Beechcraft T-34 Mentors, as illustrated above. The Mentor is not the first Beech type to enter Salvadorean service, for the AT-11 has for some years been used as a trainer, together with the North American Harvard, Vultee Valiant and Fairchild Cornell. Douglas Dakotas serve for transport.

SOUTH AFRICA

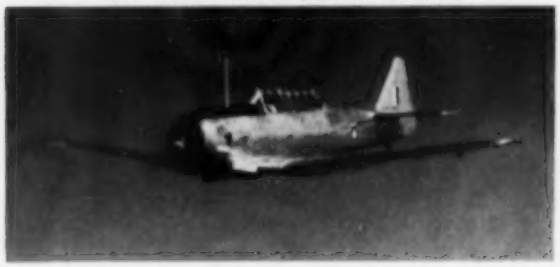
The South African Air Force

WITH COLONEL Pierre van Ryneveld as director, the South African Air Force was formed in 1920. The British Government provided a hundred aircraft. Expansion got under way in 1936, and the second world war gave an impetus to training, at the same time enabling the Government to obtain modern aircraft from overseas and to open numerous airfields and other establishments. By the end of the war the S.A.A.F. was a very considerable force with many gallant exploits to its credit in all the European theatres of war, though notably in support of the Eighth Army. Many South Africans also served as members of the R.A.F. during these years. In South Africa itself, the training organization turned out more than 16,000 personnel. Since the war an efficient force has been retained. Headquarters are at Pretoria and the Staff College is at Waterkloof, some four miles distant.

In March this year it was officially announced in Cape Town that the South African Air Force is to have air-support units for co-operation with armoured forces; that a five-year plan for the construction of an extensive radar network has been prepared and will cost about £5½ million; that helicopters will replace launches for all rescue work; that modern four-engined aircraft will take over "almost completely" the work of troop transport; that a joint operational headquarters for the armed forces is to be constructed; and that some "defence factories" are to be added to those now existing.

The Force is at present organized into elements comprising the

North American Harvard (South African A.F.).



Dornier Do 25 prototype (Spanish A.F.).

Air Staff, for policy direction; groups for executive authority, organized on a functional basis, to implement Air Staff policy; air stations, organized according to the type of units based upon them; squadrons, organized according to delegated roles; training units, varying in organization according to requirements; maintenance units; and miscellaneous units with specified functions. Tasks and commitments are the air defence of South Africa; joint responsibility with naval forces for the maritime defence of South Africa; tactical air support of land forces; and training.

Although for the Korean war No. 2 Cheetah Squadron (formerly with Mustangs) was re-equipped with North American F-86 Sabres, these aircraft are no longer on hand, and fighter and fighter/bomber operations are the responsibility of de Havilland Vampires. For maritime operations there are Short Sunderland 5 flying boats and Lockheed PV-1 Venturas. The Venturas will eventually be replaced by Avro Shackleton M.R.3s, the order for which was replaced after the Shackleton-equipped No. 42 Squadron of R.A.F. Coastal Command had flown from Ceylon to the Union during a 17,000-mile round trip from St. Eval, Cornwall. The S.A.A.F. also plans to improve its training methods, though specific information on this point is not forthcoming.

Air Chief of Staff of the S.A.A.F. is Brigadier S. A. Melville.

SPAIN

The Spanish Air Force

IN ITS present form, the Spanish Air Force, bearing the Spanish title *Las Fuerzas Aereas Espanolas*, was created on October 7th, 1939. The General Secretariat of the Air Ministry constitutes the link between the Ministry and other Ministries and Government Departments; the Under-secretariat deals with administration and plays a part in the implementation of plans prepared by the General Staff; the General Staff itself is in charge of all matters relating to the preparation of the Force for war. The Supreme Air Council is the highest advisory body on all matters relating to organization and efficiency. There are numerous subsidiary sections dealing with strategy, recruitment and maintenance, a legal department and a National Institute of Aeronautical Technology, which is in charge of technical research.

For strategic purposes Spanish territory is sub-divided into regions and zones, each one with its own general headquarters, general staff and services headquarters. The Central Air Region has its headquarters in Madrid; the Air Region of the Strait in Seville; Eastern Air Region in Valencia; Pyrenean Air Region in Saragossa; Atlantic Air Region in Valladolid; Morocco Air Zone in Tetuan; Balearic Air Zone in Palma de Mallorca; and Canaries and West Africa Air Zone in Las Palmas de Gran Canaria. Each region or zone is further sub-divided into sectors.

The Force is responsible for the defence of Spain, and its activities are co-ordinated with those of the Army, Navy and Air Transport Service.

Defence units are now being equipped with jet aircraft supplied by the U.S. Government in accordance with the Defence Agreement concluded with Spain in 1953. Earlier equipment includes Spanish-built versions of the Me 109 fighter and He 111 bomber, built under licence respectively by La Hispano Aviacion S.A. and Construcciones Aeronauticas S.A. Pilot training schools use the CASA-E.3 (Bu 131) and A.I.S.A. E.4 (H.M.) for elementary training, and the Hispano HS-42 and HS-43, North American T-6 Texan and Lockheed T-33 for later training. As a replacement for the Ju 52 transport the CASA-207 Azor, powered with Bristol Hercules 730 engines and capable of carrying 30-38 troops, is under construction. Of 112 CASA-201 Alcotan light transports, 100 are for the Spanish Air Force, and 20 CASA-202 Halcon medium transports are also on order. The first jet aircraft —nine Lockheed T-33s—arrived in March last year. Their Spanish designation is E.15 and they are based at Badajoz.

AISA I-115 (Spanish A.F.).

Spanish student jet pilots with their American instructors and T-33s.

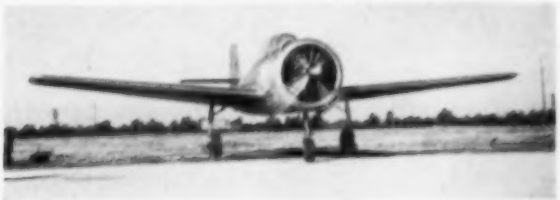
Hispano HA-1109K-1-L (Spanish A.F.).

CASA-201 Alcotans (Spanish A.F.).

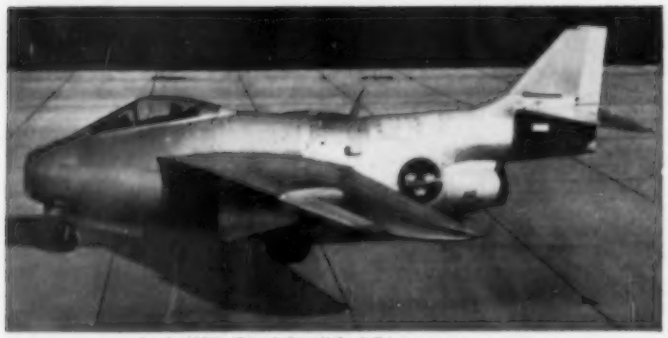
CASA-202 Halcon (Spanish A.F.).

AISA 1-18 prototype (Spanish A.F.).

(Below) Hispano HA-100-E1 (Spanish A.F.).



Saab J29s (Royal Swedish A.F.).



Saab J29F (Royal Swedish A.F.).

D.H. Vampire leaving underground hangar of the Royal Swedish A.F.

J33 (de Havilland Venom N.F.51) (Royal Swedish A.F.).

THE WORLD'S AIR FORCES . . .

SWEDEN

The Royal Swedish Air Force

THE NATIONAL title of this Service is *Flygvapnet*. Located in Stockholm, the Air Force Command is constituted by the C-in-C., the Air Staff, the Royal Swedish Air Board, the Air Observation Service, the Technical Services and the Director General of the Air Force Medical Services. Effective units for 1955 are ten day fighter wings, comprising a total of thirty squadrons; one night fighter wing (three squadrons); four attack wings (twelve squadrons); five reconnaissance squadrons; one air-base corps; and one search-and-rescue unit. The Air Observation Service, which is organized within the Air Force, is being thoroughly modernized and a network of radar stations is being set up. Combat information centres and many hangars have been blasted out of solid rock, affording safety even against atom bombs.

In peace-time the Air Force is organized into four groups, under the direct command of the C-in-C. No. 1 Group is an attack force comprising all the attack wings; No. 2 is a day fighter group, comprising five day fighter wings; and No. 3 is made up of five day fighter wings and one night fighter wing. Group No. 4 is a reconnaissance group, comprising the reconnaissance squadrons, the air-base corps and the search-and-rescue unit. Peace-time headquarters of Nos. 1, 3 and 4 Groups are in Stockholm, and the headquarters of No. 2 Group is in Gothenburg. The country is divided into five air-base districts, denominated as southern, western, eastern, northern and Upper Norland (north of the northern district).

Wings are concentrated in the central and southern areas, near the large towns, ports and centres of industry. Designations and home bases of the various wings are:—

F.1, Västmanlands flygflottilj (night fighter), Hässlö, Västeras; F.2, Roslagens flygkar (air rescue, radar school), Hägernäs, Viggbyholm; F.3, Ostgöta flygflottilj (fighter), Malmen, Linköping; F.4, Jämtlands flygflottilj (fighter), Frösön, Ostersund; F.6, Västgöta flygflottilj (fighter/bomber), Karlsborg; F.7, Skaraborgs flygflottilj (fighter/bomber, Satenäs, Tun; F.8, Svea flygflottilj (fighter), Barkarby, Stockholm; F.9, Göta flygflottilj (fighter), Säve, Göteborg; F.10, Skanska flygflottiljen (fighter), Barkakra, Angelholm; F.11, Södermanlands flygflottilj (reconnaissance), Skavsta, Nyköping; F.12, Kalmar flygflottilj (fighter), Kalmar; F.13, Bravalla flygflottilj (fighter), Norrköping; F.14, Hallands flygflottilj (fighter/bomber), Halmstad; F.15, Hälsinge flygflottilj (fighter), Söderhamn; F.16, Upplands flygflottilj (fighter), Uppsala; F.17, Blekinge flygflottilj (fighter/bomber), Kallinge, Ronneby; F.18, Södertörns flygflottilj (fighter), Tullinge, Stockholm; F.21, Norrbottens flygbaskar (reconnaissance), Kallax, Lulea; F.5, Flying School, Ljungbyhed; F.20, Air Cadet School, Uppsala.

The Central Workshops are at Arboga, Västeras and Malmslätt, and at Malmslätt also there is the Experimental Centre, where new aircraft are subjected to flight tests. Training is handled by the Flying School at Ljungbyhed and the Cadet School in Uppsala; the Staff College for advanced military studies; the Bombing and Gunnery School; the Central Training School for N.C.O.s and technical Air Force personnel; the Radar School; and the Short Service Pilot School, the latter to give complementary education on general subjects to future short-service pilots. Most personnel are permanently employed. There are about 1,200 officers and warrant officers; some 4,000 short-service pilots, technicians and other regularly employed ground personnel; 6,000 civilian employees; and 5,000 National Servicemen. Flying personnel are graded as officers, cadets and short-service pilots, the latter being N.C.O.s employed for a limited-service period of 6-7 years. The pick of the short-service pilots will have the opportunity to become officers by entering the Swedish Armed Forces High School to receive a complementary education.

Standard day fighters are the J29 (Saab-29)—including the J29F version, with reheat and revised wing; the J28B (D.H. Vampire) and J34 (Hawker Hunter F.4). Of the last-named, 140 are on order, but none has yet been delivered. The J33 (D.H. Venom) is the current night fighter, and for ground attack there

Saab A32 Lansen (Royal Swedish A.F.).

Saab S29C (Royal Swedish A.F.).

are the A29 (attack version of the Saab-29), and the twin-engined B18 (still in service in one wing). The attack wings will shortly be equipped with the Swedish-built A32 Lansen (Saab-32), this being a two-seater of excellent performance. For reconnaissance there are the S18 (Saab-18A) and S29C (reconnaissance version of the Saab-29). Transport types are the B3 (Junkers Ju 86), Tp 83 (Hunting Percival Pembroke), and Tp 79 (Douglas Dakota). Training types in service are the Sk 50 (Saab Safir), Sk 16 (Harvard), J28A (D.H. Vampire), and J28C (D.H. Vampire Trainer). The delta-wing Saab-210 Draken has been extensively flown as a research aircraft, incorporating features of the J35 fighter.

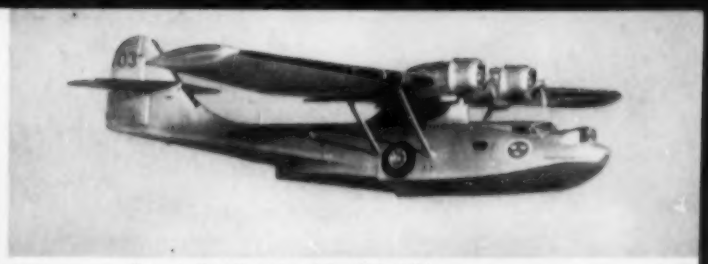
It will already have been gathered that *Flygvapnet*, with its large number of fighter units, is composed primarily as a defensive arm. Its main tasks, in fact, are to fight enemy air force units in the air and on the ground; to protect vital towns and industries against air attack; and to co-operate with the other military forces in case of enemy invasion from the air, by land or against the coast.

In October last year the Supreme Commander of Sweden's Armed Forces undertook an extremely thorough investigation, and the conclusion was reached that the fighter and attack forces should be strengthened, with the accent on the latter. The fighter balance should be shifted towards the all-weather fighter, to counter the improved performance of bomber and attack aircraft. Reconnaissance strength was considered adequate in relation to the other branches. The potentialities of the attack force were based on atomic capability and on other new weapons. Guided missiles would ultimately be introduced for defence against high-flying bombers, leaving the fighters free to cope with raiders at medium levels and to operate in support of the Army and Navy.

As an outcome of the investigation the following proposals were made for the development of the Air Force in the ten-year period 1955/1956-1964/1965. Flying units should comprise eight day fighter wings (against ten at present); three night fighter wings (against one at present); four attack wings (unchanged); and five reconnaissance squadrons. The strength of all wings would be increased by 50 per cent. This would mean an increase over the present figures of 18 per cent for fighters and 50 per cent for attack aircraft, giving a total overall increase of 22 per cent. Due to the emphasis on night and all-weather fighters two additional fighter wings would be equipped with two-seater aircraft and would need navigators. All attack wings would likewise have two-seaters. It was found that the reconnaissance squadrons had proved to be uneconomically small in relation to the large headquarters staff they required, at the same time being undermanned in certain trades. Whilst maintaining the same numbers of aircraft, therefore, the reconnaissance force was being reorganized into a smaller number of squadrons.

Air-defence guided missile units, it was proposed, should be included in the Air Force organization, and funds for continued missile development were included in the Air Force grant. Six different classes of missile were mentioned for procurement, including one for use against high-altitude bombers (which were considered to have virtually created a "new front," beyond the defence capabilities of conventional fighters); an attack missile; an air-to-air missile; two types of missile for use against naval targets; and one army anti-tank missile.

Saab S18 (Royal Swedish A.F.).



Convair Catalina (Royal Swedish A.F.).

Junkers Ju 86 (Royal Swedish A.F.).

Principal Commanders: Supreme Commander of Swedish Armed Forces, Gen. N. Swedlund; Commander-in-Chief of Air Force, Lt. Gen. Axel Ljungdahl; Chief of the Air Staff, Maj-Gen. G. A. Westring; Deputy Chief of the Air Staff, Col. S. Möller; Inspector of Air Safety, Col. (A. Cdre.) L. Peyron; Inspector of the Control and Reporting System, Col. G. Falk; Inspector of the Technical Services, Col. (A. Cdre.) K. J. A. Silfverberg; Director of Air Force Medical Services, Chief Medical Officer G. Severin; Deputy Chief of the Air Board, Maj-Gen. B. Jacobsson; Assistant Deputy Chief, Col. (A. Cdre.) L. Thunberg. Group C-in-C.s: E.1, Stockholm 80, Maj-Gen. B. Bjuggren; E.2, Göteborg C, Maj-Gen. F. Ramström; E.3, Stockholm 80, Col. (A. Cdre.) T. Rapp; E.4, Stockholm 80, Col. (A. Cdre.) I. Berg.

Saab-91B (Sk 50) Safirs (Royal Swedish A.F.).

Saab-210 (research aircraft for J35 fighter) (Royal Swedish A.F.).

(Below) Hunting Percival Pembroke (Royal Swedish A.F.).

D.H. Vampire F.B.6 (Swiss A.F.).

D.H. Venom F.B.50s (Swiss A.F.).

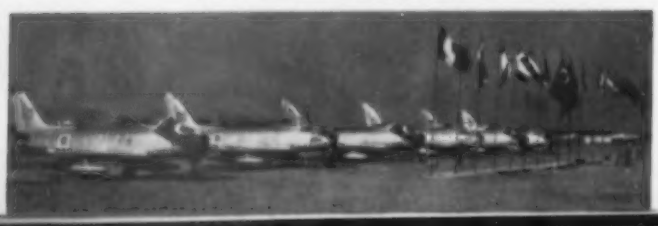
Gloster Meteor F.8s (Syrian A.F.).

North American Harvard (Syrian A.F.).

Officers of a Firefly squadron (Royal Thai Navy).

Lockheed T-33 (Turkish A.F.).

(Below) Canadair-built Sabres (Turkish A.F.).



THE WORLD'S AIR FORCES . . .

SWITZERLAND

The Swiss Air Force

THE FLYING units and ground personnel of the Swiss Air Force are organized in air regiments and airfield regiments. The air regiments include between five and eight squadrons (*staffeln*), and the airfield regiments comprise several detachments, which, in their turn, include a number of companies, aircraft batteries and units for guard, defence and airfield maintenance. Strength, including the early-warning service, is about 20,000 men and 400 fighting aircraft, and operational tasks are those of a tactical air force. The Force is mainly equipped with D.H. Venoms and Vampires, but one or two squadrons are still operating with North American Mustangs. Future plans include the further extension of the infrastructure and the replacement of the Mustangs by jet aircraft. It is intended to equip certain units with P.16 attack bombers, two prototypes of which should shortly be flying. The P.16 (Sapphire) is laid out along Shooting Star lines and is designed to have an unusually good short-field performance. The company responsible is Flug. und Fahrzeugwerke A.G. (formerly Dornier-Werke A.G.), at Altenrhein.

Principal commanders of the Swiss Air Force: Commander of the Air and Anti-Aircraft Troops, Oberstdivisionär Primault; Commander of the Air Force, Oberstbrigadier Bachofner; Commander of Airfields, Obsertbrigadier Burkhard; Commander of the Anti-Aircraft Arm, Oberstbrigadier Meyer.

SYRIA

The Syrian Air Force

AIR DEFENCE, ground support, air transport, reconnaissance and "exceptional missions" are the tasks to which the Syrian Air Force is committed. The Force is organized to include an aviation college and schools; several tactical groups, each having a variable number of wings (a wing being composed of a variable number of squadrons); an aeronautical institute; a technical institute; an administrative wing and a technical wing; and schools of aviation trades and of navigational aids. Additionally there is a transport group of several wings and the usual communications, medical, stores and workshop elements. The commanding staff consists of the C-in-C., the chief of staff, the administrative assistant and the technical assistant, the C-in-C. being the immediate assistant of the chief of staff of the general headquarters in all matters relating to the air force.

Air Force Command is intent on keeping its groups equipped with up-to-date aircraft and on taking action to prepare the necessary facilities and airfields. Fighter aircraft are the Gloster Meteor F.8, Armstrong Whitworth Meteor N.F.13 and Supermarine Spitfire 22. Transports are the Douglas Dakota C-47B, Junkers Ju 52, Beechcraft D-18S, D.H.89 and Fairchild F-24, and standard trainers are the North American Harvard, D.H. Chipmunk, Fiat G.46, G.55 and G.59.

THAILAND

The Royal Thai Air Force

FIRST-LINE equipment of this Service includes Grumman Bearcats, six of which, together with one of the Force's Dakota transports, visited R.A.F. stations and squadrons in Singapore and Malaya late in 1953. The formation was commanded by A. Cdre. Prince Rang and his deputy was A. Cdre Chalern Kiert. For training, D.H. Chipmunks, Miles Magisters and North American Harvards have been supplied, and Westland-Sikorsky Dragonfly helicopters are available for general purposes.

The Royal Thai Navy

SEVERAL FAIREY Firefly Mk 1 reconnaissance fighters were supplied to the Royal Thai Navy in 1952. They were delivered by sea and assembled and tested at Don Muang.

TURKEY

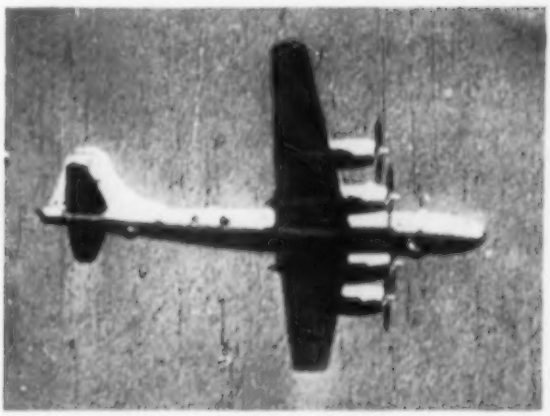
The Turkish Air Force

OVER 90 per cent of the Turkish Air Force has been placed at the disposal of NATO. Personnel strength has been put at 29,000 and twelve tactical squadrons have been assigned to NATO Command. A number of new air bases are being built and old ones extended. The most modern fighters are Canadair-built North American Sabre 4s, and there are many squadrons of Republic F-84 Thunderjet fighter/bombers. Earlier equipment has included Lockheed T-33s for conversion training, and de Havilland Mosquito and Douglas Invader light bombers. Some Spitfires and Thunderbolts may also remain. Standard transports are the Dakota and Expediter, and Harvards and Oxfords are numbered among the trainers.

Mig-17s (Soviet A.F.).

Russian four-jet bomber ("Bison") escorted by Mig-17s (Soviet A.F.).

Mig-15 with U.S.A.F. markings (Soviet and satellite A.F.s).



Tu-4 (Soviet A.F.).

U.S.S.R.

The Soviet Air Force

REPLYING last May to a question in the House of Commons, the Under-Secretary to the Foreign Office said that manpower "in the air forces in the Soviet Union" had remained at about 800,000, and the number of aircraft at 19,000-20,000. There had been a steady replacement of piston-engined fighters and light bombers with jet-propelled types. In 1951 20 per cent of the fighters were jet-propelled; by May 1954 the figure had been brought to nearly 100 per cent. As for light bombers, in 1951 there were no jet-propelled machines at all in this category, but by May 1954 the percentage was 66⅔. The number of Tu-4 medium piston-engined bombers in operational units had doubled since 1951. In the satellites and East Germany, manpower had increased from 50,000 in 1951 to nearly 90,000. Aircraft strength, which was about 2,000, had almost doubled, and about half the machines were jet fighters.

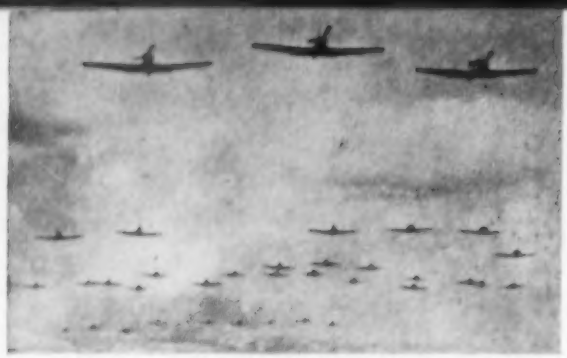
Less than six months ago General John E. Hull, U.S.A.F., declared that in the Far East, Communist air strength, including Chinese, Russian and North Korean forces, was 7,000-8,000 aircraft, including between 700 and 900 Il-28 twin-jet bombers, and more Tu-4 piston-engined bombers than the total of B-29s employed by America against Japan in the second world war. Additionally the Communist forces in the Far East included Mig-17s.

Unlike the Royal Air Force or U.S.A.F., the Soviet Air Force is not an independent arm. Fighter, light bomber and ground-attack elements operate under Army Command, while the Soviet Navy has control of fighter, reconnaissance and strike squadrons.

Para-drop from Il-12s (Soviet A.F.).

Lease-Lend Douglas Dakota (Soviet A.F.).

(Below) Il-14 (Soviet A.F.).



Yak-18s (Soviet A.F.).

UT-2 trainers (Soviet A.F.) spell "Glory to the Communist Party."

"Hound" transport and assault helicopters (Soviet A.F.).

"Badger" (Soviet A.F.).

Il-28 (Soviet A.F.).

"Bosun" (Soviet A.F.).

THE WORLD'S AIR FORCES . . .

The strategic bomber force, or "long-range aviation," is another separate arm, controlling also the transport squadrons and subordinate to the Supreme Defence Council. Then there is a home defence force, controlling intercepter squadrons and anti-aircraft defences.

Much of the present-day equipment is of remarkably advanced design and of proven performance. The most widely used fighters are the Mig-15, Mig-15*bis* and Mig-17, the two first-named types, and possibly the third also, being powered with developments of the Rolls-Royce Nene centrifugal-flow turbojet, of 6,000 lb thrust or higher. So far as is known the "15s" are not supersonic, even in the dive, but the "17" is a more advanced design, with a higher degree of sweepback, and is almost certainly capable of Mach numbers superior to 1. Gun armament is standard on all three types. Under the Allied code-name system the Mig-15 and 15*bis* are known by the name Falcon and the Mig-17 is dubbed Fresco. Small quantities of La-9, La-11 and Yak-9 piston-engined fighters (Fritz, Fang and Frank respectively) remain in service, as do the straight-wing jet-propelled Yak-17 (Feather) and Yak-23 (Flora).

Preponderating in the light bomber units is the Il-28 straight-wing twin-jet bomber (Butcher), a machine corresponding in performance and purpose to the English Electric Canberra and powered with two Nene-development turbojets. Naval units employ a somewhat similar type, of Tupolev design, and known as Bosun. In the May Day fly-past over Moscow last year a new and impressive twin-jet machine, later and larger than either Butcher or Bosun, and code-named Badger, made its first appearance. Nine were seen in all, and of these General Nathan F. Twining, U.S.A.F. Chief of Staff, said, "They are comparable in size and design to our own B-47." Even more significant, according to the General, was the first appearance of a new four-jet heavy bomber (Bison). "This heavy bomber," said General Twining, "is comparable in size and appearance to our own B-52"; and he went on to point out that the turbojets both in Badger and Bison must be of very high output indeed. It is generally reckoned, that they deliver thrusts of the order of 15,000 lb.

The Tu-4 (Bull) bomber, with four piston engines, is a near-replica of the Boeing B-29, and many hundreds remain in service, in addition, perhaps, to piston-engined types of later pattern. Quantities of Tu-2 attack bombers, with two piston engines (code-named Bat) are also on hand, as are Pe-2 twin-engined attack aircraft (Buck). Standard transport machines are the Russian-built Dakota, or Li-2 (Cab), the Russian-designed Il-12 (Coach) and the Il-14, a development of the same type. Catalina flying boats (Mop) are also in service. There are, moreover, at least two types of helicopter, corresponding approximately to the S-51 and S-55. Standard trainers include the piston-engined Yak-18 and Yak-11, and two-seat conversions of the Yak-17 and Mig-15 jet fighters. Prototypes have included a rocket fighter based on the Me 263, but to what extent this machine has been developed is not known.

North American F-86F Sabres (U.S. Air Force).

U.S.A.

The United States Air Force

SINCE THE outbreak of fighting in Korea in the summer of 1950, the United States Air Force has become the largest, and by far the most important, military force in the Western world. It has steadily grown in size and striking power; and, at the same time, the whole Service has acquired a sober efficiency which matches its immense commitments. According to American precepts, no official is above investigation, and the taxpayer demands to see that he gets his money's worth; it follows, therefore, that everything in the U.S.A.F. is there for a specific purpose and is used accordingly. As a result, the maintenance state of any squadron, the combat-readiness of any wing and the annual utilization of each aircraft in the U.S.A.F. is now higher than the average for any other air force in the world.

When the "cold war" became locally "hot" in June 1950, there were 42 Operational Combat Wings* in the U.S.A.F., backed up by another 32 in the Air National Guard (page 665) and the Air Reserve. During the following 12 months, men and equipment from the reserve forces became absorbed into the regular U.S.A.F. so that the figures in 1951 were: U.S.A.F., 72 Combat Wings; Reserves, 5. At the same time, a "crash programme" of expansion was undertaken. The latter was the subject of much argument, but the final choice of the Truman administration was a 143-Wing Air Force, comprising 126 Combat Wings and 17 Troop Carrier Wings. To meet this huge requirement, very large production contracts were placed, in some cases for aircraft which were not fully developed—as was done in Great Britain.

As a result, severe problems were encountered. Some types of aircraft—such as the F-84F—fell seriously behind schedule, production of equipment and auxiliaries was insufficient for the overall programme, base construction was not properly matched to requirements and, most important of all, the steady forming of new wings and re-equipment of existing wings resulted in a marked reduction in combat-readiness of the Air Force as a whole. Even relatively unaffected units lost their most experienced personnel who were posted to form cores, or cadres, for new wings. In addition, huge sums had to be voted towards the cost of modernization programmes to make the new aircraft fit for service.

Something better was needed, and the Eisenhower administration, greatly assisted by the "cease-fire" in Korea in 1953, produced a rational programme spread over a number of years. The basis of the programme is for a build-up to 137 Wings by June 30th, 1957; a period long enough for the virtual elimination of compromises, and for the attainment of a thoroughly modern, efficient and combat-ready force. There should be 108 Operational Combat Wings in the coming summer, together with 13 Operational Transport Wings. From 8 to 10 Combat Wings are now being added to the Air Force each year, this having been selected as an optimum rate causing little unbalance to the force as a whole. Furthermore, it is matched to the size of the American aircraft industry, which can plan ahead at a high level of production without fear of future recession. During the past year, military deliveries averaged about 900 aircraft per month, but a slight downward trend is now showing as aircraft become more complex and expensive.

In 1951 (the last year for which such a break-down is available) the U.S.A.F. had an inventory of 8,159 combat machines, together with 2,859 transports, 5,961 trainers and 358 communication aircraft—a total of 17,337. In 1954 the grand total was around 22,300 aircraft, including 17,700 "active" and 4,600 "inactive" (i.e., in reserve). The total personnel amount to some 950,000 officers and men, and an increase of 20,000 is scheduled for the eventual 137-Wing force in June of 1957. Owing to the high rate of "separations" (men leaving the Service) it is expected that difficulty will be experienced in meeting the man-power requirement, and the U.S.A.F. has now been empowered to set up its own recruiting organization. Labour troubles are, to some extent,

* *Although the Wing is the basic operational U.S.A.F. unit, it varies in size according to the type of aircraft. Present authorization is: heavy bomber, 30 aircraft; medium bomber, 45; light bomber, 48; fighter/bomber, 75; fighter/intercepter, 25 aircraft per squadron.*

North American F-100A Super Sabre (U.S. Air Force).

Convair F-102A (U.S. Air Force).

McDonnell F-101A Voodoo (U.S. Air Force).

North American F-86D Sabre (U.S. Air Force).

Northrop F-89C Scorpions (U.S. Air Force).
(Below) Lockheed F-94C Starfires (U.S. Air Force).

Boeing RB-47E and B-47E Stratojets (U.S. Air Force).

Convair GRB-36 and FICON F-84F (U.S. Air Force).

Boeing RB-52B Stratofortress (U.S. Air Force).

Martin RB-57A Canberras (U.S. Air Force).

Douglas RB-66A (U.S. Air Force).

Lockheed RC-121C (U.S. Air Force).

Republic F-84F Thunderstreaks (U.S. Air Force).

THE WORLD'S AIR FORCES . . .

being eased by a careful examination of requirements on a commercial basis (in some cases making use of business-efficiency experts) and by what is termed "Project Native Son"—a programme which aims at replacing as many as possible of the U.S.A.F. personnel serving outside America with nationals of the country concerned. This has already reached an advanced stage in England; even in the U.S.A. itself, civilian employees are being brought in to replace airmen.

The total U.S.A.F. vote this year is $15.5b—almost exactly half the $32.9b allocation to all "defense services" and twice as much as the Army or Navy allocation. Most of the money to build up the 137-Wing Air Force was allocated earlier, and the 1956 budget figure is largely for bringing Wings up to date and in maintaining them operationally.

This "New Look" Air Force is now steadily taking shape. Into it are being woven new techniques—such as those associated with handling complex weapons systems—which are putting the service technologically ahead of any other in the world. At the same time, a global network of Air Force Bases is being built up, upon which the might of the U.S.A.F. can be most effectively disposed to meet the fluctuating requirements of the political scene.

The Command of the U.S.A.F. which is chiefly responsible for this "peace-keeping" function is the renowned Strategic Air Command (Gen. Curtis E. LeMay, Offutt A.F.B., Nebraska; 1957 strength: 55 wings). The primary job of S.A.C. is to carry thermo-nuclear weapons to any enemy target worthy of such treatment; and until called upon to do this, the Command's importance is vested in the fact that it *can* do it. More than that, it enjoys a higher state of training and availability than any other military force in the world; it operates continuously on a war-time basis, and can strike at any target (with devastating weapons) within a matter of hours. It has evolved a special programme of maintenance which ensures that, at any time, all but a tiny fraction of its operational strength is combat-ready.

The very-long-range backbone of S.A.C. is still the giant Convair B-36, the largest military machine ever built. It is considered a debatable point whether or not the 300+ B-36s in S.A.C. could effectively be used against well-defended targets. New techniques, however, are keeping the potency of the big bomber at a formidable level. One such technique is the FICON system of "parasite" aircraft carried under the B-36 to within about 100 miles of target and there released. The parasite—generally an RF-84F—then drops a nuclear weapon or takes photographs, and then returns to a rendezvous with the B-36 on its homeward trip (picture, column 1). Other new devices are being incorporated in both bomber and reconnaissance B-36s.

The solid backbone of S.A.C. consists of the numerous wings of medium bombers, now almost wholly equipped with Boeing B-47Es (the few B-50 units left are used for met. recce.). While these Medium Bomb Wings were converting from piston-engined equipment to B-47s, their effectiveness was completely eliminated for from three to six months, and it required the best part of a year for full combat-readiness to be regained; but over 1,500 B-47s have now been absorbed by these Wings, and nearly all are combat-ready.

Each Wing is rotated around a circuit of bases, principally in America, England, North Africa, Spain or Turkey, the Far East, and the Arctic. Ninety days is a typical period of occupation of any one base, and everything to do with the Wing is air-lifted with it when it moves out. Flight refuelling is widely employed to provide the B-47s with global mobility, and an FR contact is made by S.A.C. roughly every 3½ minutes. It may be added that, during training missions, the 47s carry blocks of concrete equal in weight to the stores they would carry in the event of war.

The B-47s are now being supplemented by the long-range Boeing B-52, which is destined to replace the B-36 during the next two years. Already one Wing—the 36th—has equipped with the B-52B at Castle A.F.B., and others are forming. The eight-jet heavy bomber is being built at both Seattle and Wichita, and some hundreds are expected to be in service in a year's time. In service, they will be partnered by the 140-ton Boeing KC-135 tanker, which will refuel the B-52 at operational height and speed.

S.A.C. may also operate the McDonnell F-101A Voodoo, a big, single-seat, twin-jet machine with a higher operational speed

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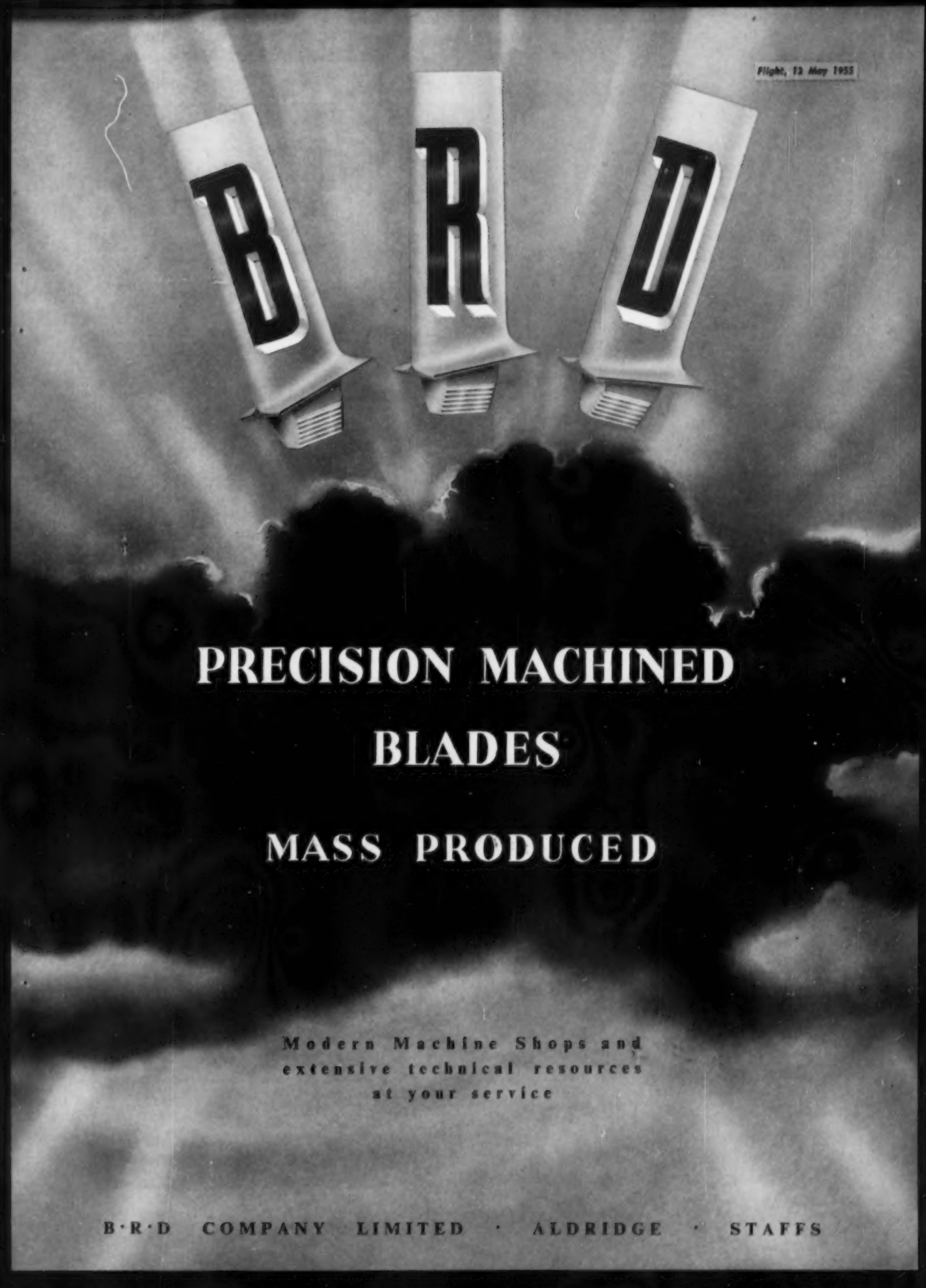

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THE WORLD'S AIR FORCES . . .

than any other military aircraft. Equipped to carry nuclear weapons, the F-101 has a range exceeding 2,000 miles; there is also a photo-reconnaissance version.

Mention must also be made of the Convair XB-58, the world's first supersonic bomber. A prototype of this 1,000 m.p.h. machine is now approaching completion, and it may fly this year.

Another formation which will be of great importance to the revised Air Force is Tactical Air Command (Gen. Otto P. Weyland, Langley A.F.B., Virginia; 1957 strength: 29 wings). As a result of steady improvement in the development of tactical atomic weapons, virtually every modern fighter has atomic capability. Certainly it is possessed by every machine in T.A.C., and the Command's striking power is scarcely less than that of S.A.C. itself. T.A.C. is intended for relatively localized missions, but flight refuelling is a standard T.A.C. procedure, employed not only operationally but also to give the Command global mobility.

The chief types used are the Republic F-84F and RF-84F, the Martin B-57 family of Canberra developments and the Douglas B-66 series. All these are atomic-bomb carriers with Mach = 0.9+ performance. Another very important machine to T.A.C. is the Lockheed C-130, which, while acting as the principal logistic support aircraft capable of carrying all a T.A.C. wing's ground gear, will also double as the chief refueller. All the aircraft mentioned are entering service in numbers.

Air Defense Command (Gen. Benjamin W. Chidlaw, Ent A.F.B., Colorado; 1957 strength: 38 wings) is anxiously awaiting the arrival of supersonic intercepters armed with guided missiles. Until 1953 A.D.C. was equipped chiefly with two-seat machines armed with cannon, but rocket-armed aircraft are now preponderant. The standard weapon is the F.F.A.R. (folding-fin aircraft rocket), with a calibre of 2¾in, which can be carried by the dozen and fired in salvoes to "blanket" an area of sky as large as a football field. Associated with this weapon is a new type of fire-control system which continuously computes the desired flight-path for the fighter and, by means of an autopilot, causes the fighter to follow it.

This automatic radar-directed procedure led to the "collision-course" interception, in which the fighter closes on its target from abeam, fires its rockets at the right point and breaks away. The whole interception is controlled by ground or airborne radar, the pilot "sitting-in" as a monitor. A navigator is not needed, although one is carried by the long-range F-89 Scorpion. The latter are employed by A.D.C., but are more important outside the metropolitan U.S.A. The chief A.D.C. machines are the North American F-86D Sabre, a very fast single-seater carrying 24 rockets, and the Lockheed F-94C Starfire, a two-seater carrying twice as many missiles. Wings of these machines are based all over the U.S.A., where they are kept at immediate readiness to investigate unexplained returns picked up by the Continent's radar defence network. The latter is already enormous, but the big early-warning stations are not yet all operational; many of the latter are situated well out from the coast, in ships or fixed "forts." The radar chains are linked with those of Canada (p. 619). The U.S.A.F., like the Navy, employs units of high-flying early-warning Super Constellations. The Air Force machines are designated RC-121C and carry a crew of 32. They can act as fighter-direction centres.

By next year it is hoped to have Wings of Convair DF-102s in action. These are supersonic delta-winged single-seaters, each of which can carry six Hughes GAR-98 Falcon homing missiles. Both the aircraft and its missile are now almost fully developed, and the combination is expected to prove 100 per cent lethal to any type of aircraft which could attack America.

There are also many day fighters in A.D.C., including F-86F Sabres and F-100A fighter/bombers. The latter, the first supersonic aircraft to enter service with any air force, is in very large scale production and is also being developed to perform specialized roles such as attack and all-weather interception. Most types of U.S.A.F. day fighters have been armed with six 0.50in guns, but the F-100A and also the F-86K (a gun-armed version of the F-86D) each carry four of the fast-firing M-39 20mm cannon. This gun was battle-tested in Korea with outstanding success, and it has been adopted as a standard U.S.A.F. weapon. For collision-course interceptions, however, the F.F.A.R., or its successor the Falcon, must be used. It is also appreciated that day fighters have only limited use, and most new designs are being equipped from the start with radar fire control. The fastest Air Force aircraft of all, however, is a day fighter: the Lockheed F-104A, with a tiny straight wing, a high "T-tail" and gun armament. Prototypes of this Sapphire-powered machine have flown and a service-test batch is being evaluated.

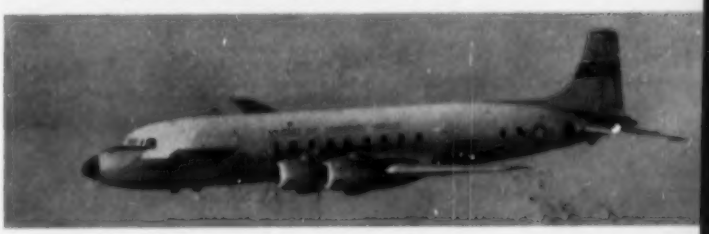
Air Defense Command has also eyed the v.t.o. intercepter with more than passing interest. Ryan have, in fact, built a prototype designated XF-109, which achieves vertical take-off on the power of a single Rolls-Royce Avon. The U.S.A.F. have not sponsored development of interim turboprop v.t.o. machines, but are waiting for worth-while supersonic prototypes—of which the F-109 may be the precursor.

Lockheed C-130A Hercules (U.S. Air Force).

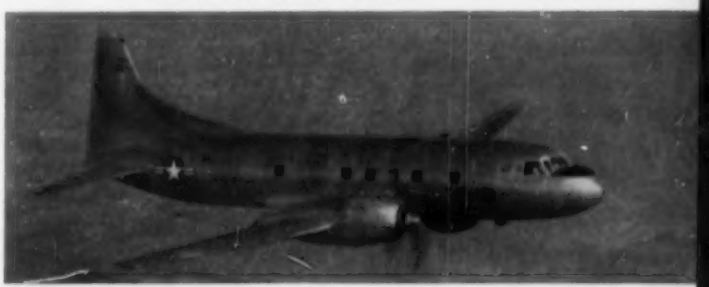
Boeing KC-97G Stratofreighters (U.S. Air Force).

Fairchild C-119C Boxcars (U.S. Air Force).

Douglas C-124C Globemaster (U.S. Air Force).



Douglas C-118A (U.S. Air Force).



Convair T-29D Flying Classroom (U.S. Air Force).
(Below) North American T-28As (U.S. Air Force).

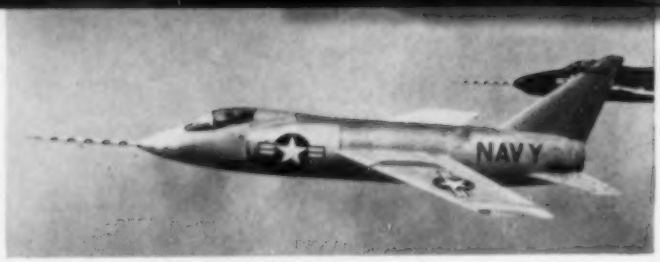
Grumman SA-16A Albatross (U.S. Air Force).

McDonnell F2H-2P Banshee and Grumman F9F-5 Panther (U.S. Navy).

Douglas F4D-1 Skyray (U.S. Navy).

North American FJ-4 Fury (U.S. Navy).

McDonnell F3H-1N Demon (U.S. Navy).
(Below) Grumman F9F-6 Cougars and Chance Vought F7U-3 Cutlass (U.S. Navy).



Grumman XF11F-1 Tiger (U.S. Navy).

THE WORLD'S AIR FORCES . . .

Last summer a new formation was announced: Continental Air Defense Command, also based at Ent and commanded by Gen. Chidlaw. This is principally a co-ordinating organization, intended to provide for optimum disposition and availability of the nation's entire defensive strength, not only Air Force but also that of all other Services and civil organizations. Gen. Chidlaw, as commander of C.A.D.C., acts for the U.S.A.F., the executive agency; in his new appointment he is responsible directly to the Joint Chiefs of Staff.

Together, A.D.C. and C.A.D.C. are being welded into a single defensive "complex" capable of meeting the threat of any future conflict. Perhaps the greatest task currently facing the Defense system is the introduction of ground-to-air guided weapons. Such weapons are already in large-scale service (Nike is the first to become operational), the U.S.A.F. being principally responsible for their introduction.

The largest air-transport organization in the world is the Military Air Transport Service (Lt. Gen. Joseph Smith, Andrews A.F.B., Maryland; 1957 strength: 15 wings). This is a joint U.S.A.F./Navy service, formed in 1948 and combining the best operational features of both Services. M.A.T.S. has bases all round the world, some of the more important being in Greenland, Maine, Newfoundland, Hawaii, Japan, Saudi Arabia, the Azores, N. Africa, Germany, the Philippines, Alaska and Central and South America. Air Force and Navy units and personnel live and operate side-by-side, there being about 150 M.A.T.S. units outside the metropolitan U.S.A.

M.A.T.S. is basically organized into three divisions. The Continental Division (San Antonio, Texas) maintains three main routes serving the Alaskan, Caribbean/S. American and Pacific areas; it also operates an air-evacuation service for the transport of patents from any part of the world, a Ferry GGroup which positions several thousand new aircraft each year, and three transport training schools. The Atlantic Division (Westover A.F.B., Massachusetts) operates many routes across the Atlantic, together with a network of routes in Europe, Africa and all the Near and Middle East. The Pacific Division (Hickam A.F.B., Hawaii) flies very long stages across the Pacific and joins the other two Divisions.

The principal aircraft used by M.A.T.S. are the Boeing C-97 Stratofreighter (65 stretcher patients and over a dozen flight crew and medical attendants, or some 100+ passengers), the Douglas C-118 or (Navy) R6D, a Service version of the DC-6A used in large numbers, and the Douglas C-124 Globemaster, employed for heavy logistic freighting of loads up to 45 short tons in weight. Also used are the Douglas C-74 Globemaster and the C-54M (Navy, R5D) ambulance.

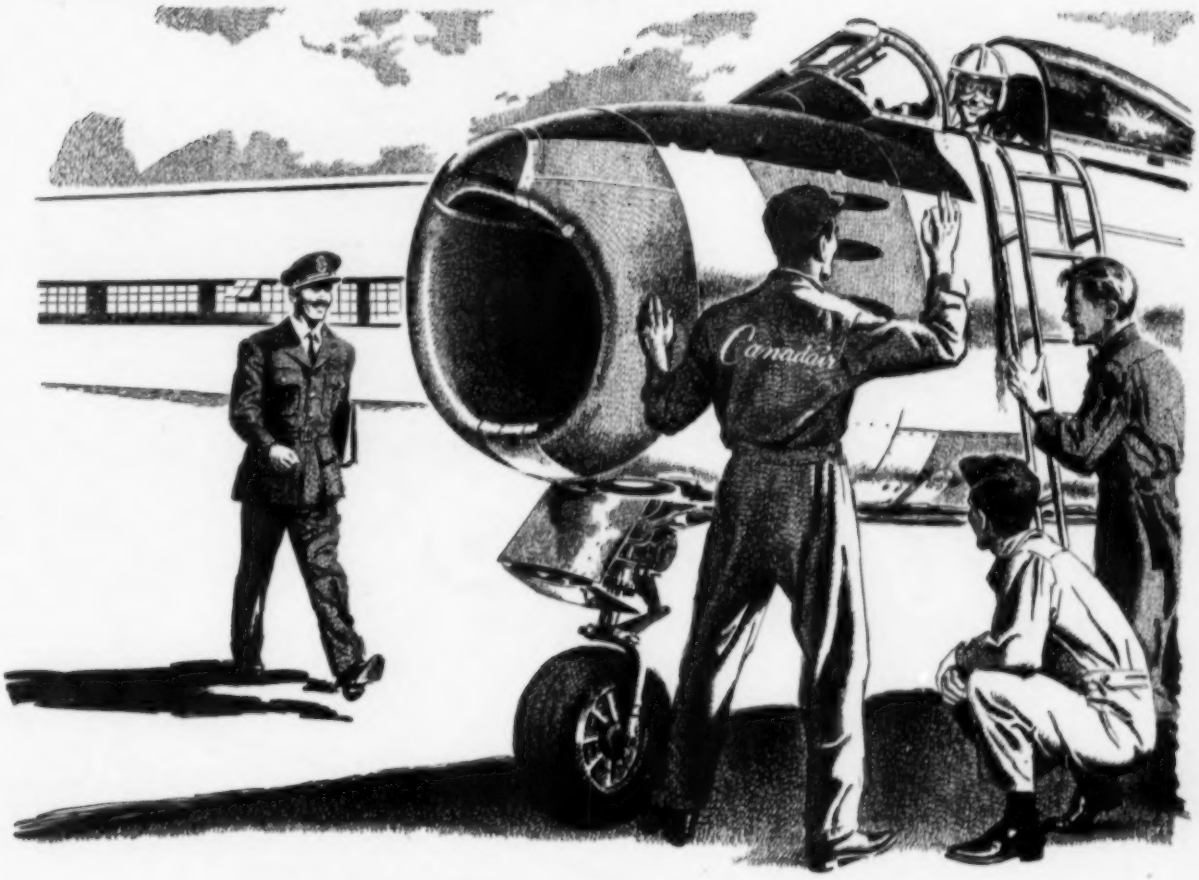
M.A.T.S. employs the C-131A Samaritan for casualty-evacuation. This military version of the Convair-Liner has also been used as a test-bed for T56 turboprops, and crew-training versions, designated T-29, are widely used by Air Training Command.

M.A.T.S. also operates the Air Weather Service, responsible for 7 per cent of the M.A.T.S. estimated total cost of $500m per annum. The A.W.S. operates over 250 weather stations (one on a Polar ice-floe), 25 mobile units and six weather recce. squadrons of (chiefly) Boeing WB-29s. The latter fly from Guam and Bermuda into the eyes of typhoons, and have also flown well over 1,000 times to the N. Pole itself. The Airway and Air Communication Service, another M.A.T.S. subsidiary, costs over $90m per year, and provides facilities on a global basis for all military and civilian users. Another major section is the Air Rescue Service, the numerous aircraft of which are distinguished by a number of yellow rectangles and bands outlined in black. The chief types used are the Grumman SA-16 (Navy, UF) Albatross and the Douglas C-47, affectionately dubbed the "Goony Bird."

"Back-room" Commands of the U.S.A.F. are the Air Research and Development Command (Lt. Gen. Thomas S. Power, Baltimore, Maryland), the Air Proving Ground Command (Maj. Gen. Robert W. Burns, Eglin A.F.B., Florida), the Air Materiel Command (Gen. Edwin W. Rawlings, Wright-Patterson A.F.B., Ohio), the Air Training Command (Lt. Gen. Charles T. Myers, Scott A.F.B., Illinois), the Air Academy (Lt. Gen. Hubert R. Harmon) and the Air University (Lt. Gen. Laurence S. Kuter, Maxwell A.F.B., Alabama), and the H.Q. Command and Security Service.

Special mention should also be made of the Continental Air Command (Lt. Gen. Leon W. Johnson, Mitchel A.F.B., New

We bridge the Oceans...



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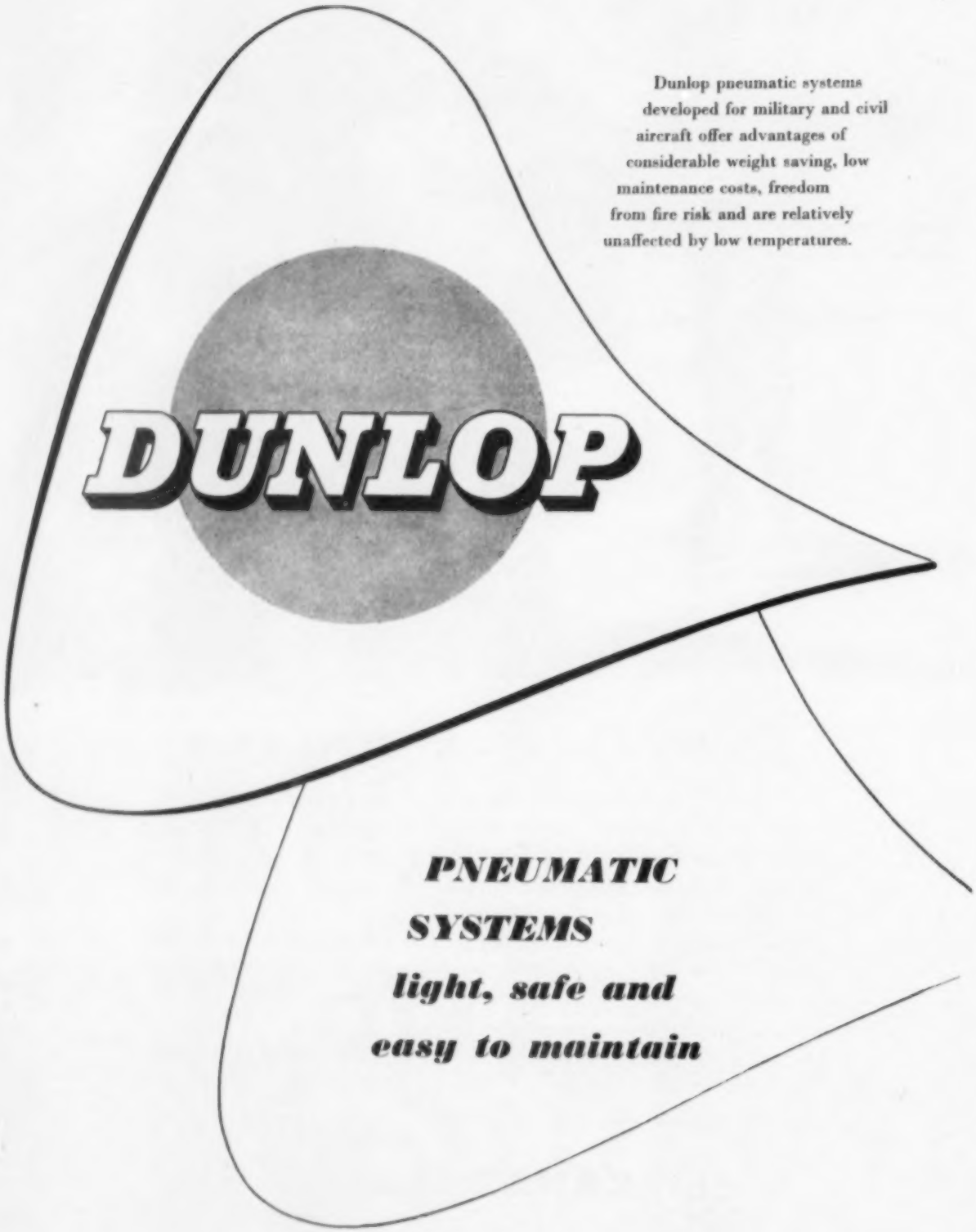

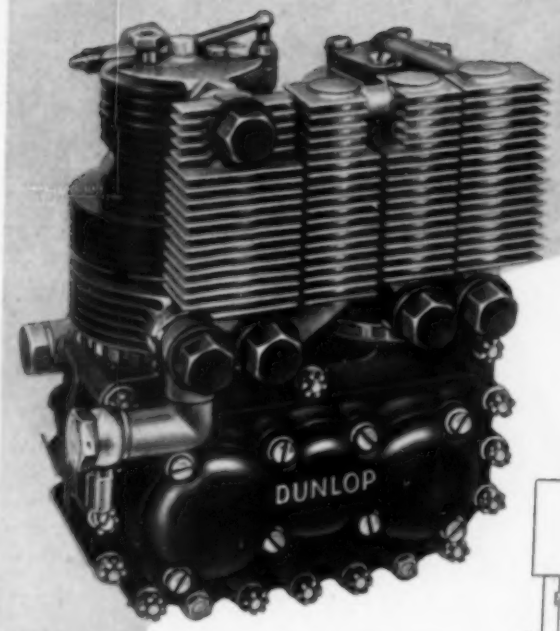

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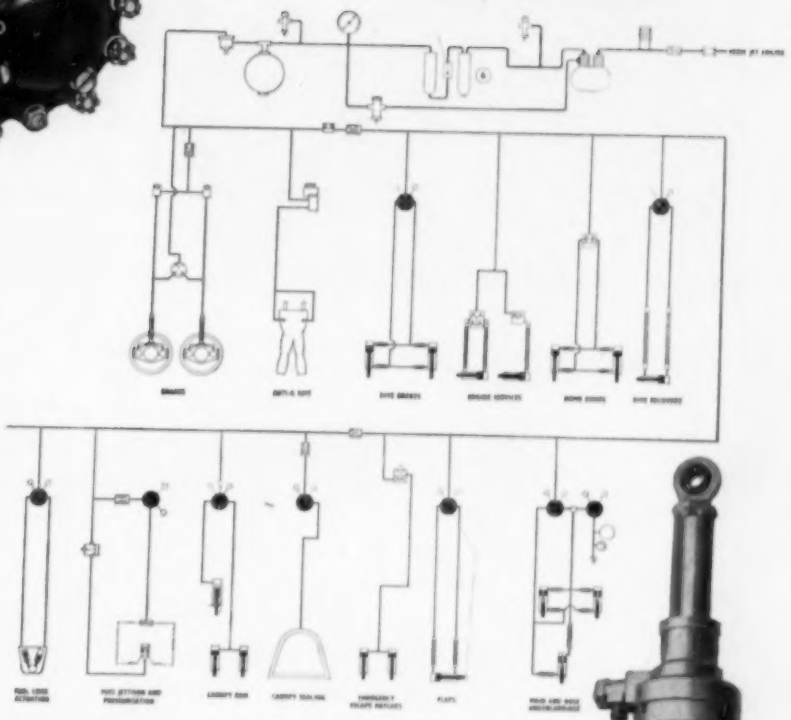

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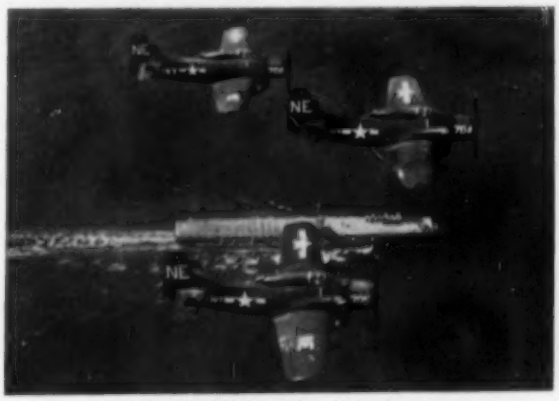
Martin XP6M SeaMaster (U.S. Navy).

Douglas A4D-1 Skyhawk (U.S. Navy).

Douglas A3D-1 Skywarriors (U.S. Navy).



Douglas AD-4W Skyraiders (U.S. Navy).

Sikorsky HSS-1 (left) and Bell HSL-1 (U.S. Navy).

Grumman S2F-1 Sentinel (U.S. Navy).
(Below) Lockheed P2V-3 Neptune and K-blimp (U.S. Navy).

THE WORLD'S AIR FORCES . . .

York), which trains the Air Force Reserve, the Air National Guard, and supervises the Air Force Reserve Officers Training Corps and the Civil Air Patrol. Of these organizations, the Air National Guard is the most important, and it corresponds roughly to our R.Aux.A.F. The A.N.G. was largely pulled into the regular Air Force in 1950, but it is now stronger than ever before, and its strength is once more on a peace-time footing under State control. Since March, 1953, the number of aircraft in the hands of the civilian components of the Air Force has more than doubled, and 44 fighter, light bomber, reconnaissance and troop-carrier wings have been organized. Of the Air National Guard's 87 Tactical Squadrons, 62 were jet-equipped a year ago.

Overseas U.S.A.F. strength is as great as that based in the U.S.A., and is divided into five Commands. The Alaskan Air Command (Maj. Gen. George R. Acheson, Elmendorf A.F.B.) is equipped with, *inter alia*, wings of long-range all-weather Scorpions, which can operate even in the adverse weather conditions prevalent in the Alaskan and Aleutian region. The Northeast Air Command (Lt. Gen. Glenn O. Barcus, Pepperrell A.F.B.) is an air-defence force loosely integrated with the R.C.A.F., and its bailiwick ranges over the whole area north and east of the N. American continent. Caribbean Air Command (Maj. Gen. Reuben C. Hood, Jr., Albrook A.F.B., Canal Zone) controls a strong complex of bases and operational formations extending around the north coast of S. America, and across to Puerto Rico, Cuba and other West Indian islands. Military exercises are frequently held in this region, and the great range of the U.S.A.F. Missile Test Center extends into the Atlantic off Caribbean's eastern border. Far East Air Force (Gen. Earle Partridge, Tokyo) has a strength of 14 Wings.

The United States Air Forces in Europe (USAFE) is one of the largest of all overseas commands (Lt. Gen. William H. Tunner, Lindsey A.F.B., Wiesbaden). All U.S.A.F. activities in Europe come under the jurisdiction of this headquarters, with the exception of S.A.C.'s training programmes in England and N. Africa. The chief units of USAFE are the 12th Air Force in Germany and France, the 3rd Air Force in the United Kingdom, the 5th Air Division in French Morocco, the 80th Air Depot Wing at Nouasseur, French Morocco, the 73rd Air Depot Wing at Chateauroux, France, and the 85th Air Depot Wing at Erding Air Depot, Germany.

Included in 12th Air Force are numerous Wings of tactical aircraft, including RF-80s, F-86Fs, F-86Ds, F-84Gs, F-84Fs, and B-57s. Most of this strength is based along the line of the great new NATO bases west of the Rhine. From the NATO point of view—which is of primary importance, operationally—this Air Force is a part of the 4th Allied Tactical Air Force.

In the United Kingdom there are three U.S.A.F. Commands: the 3rd Air Force and 7th Air Division (Maj. Gen Roscoe C. Wilson and Brig. Gen. Thomas C. Musgrave, Jr., respectively, South Ruislip, Middlesex) and the Northern Air Material Area (Brig. Gen. Troup Miller, Jr., Burtonwood, Lancs.). The 3rd A.F. combat units include the 49th Air Division (B-45s and F-84Fs), the 406th F/I Wing (F-86Ds and F-86Fs), and the 582nd Air Resupply Group (which is essentially a support unit, equipped with C-119s, SB-29s and SA-16s). The 7th Air Division is an operational organization under the direct control of S.A.C.

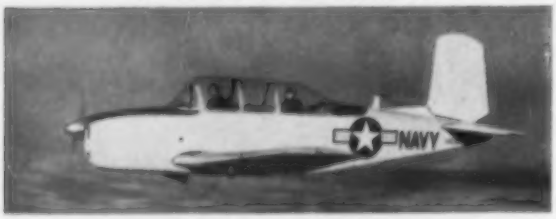
The United States Navy

AS MIGHT be expected, the air strength of the U.S. Navy is very great; in fact, this Service incorporates the third largest "air force" in the world, the only larger flying Services being the Air Forces of the U.S.A. and U.S.S.R. Naval aviation in America has no separate mission or operational organization, but forms an integral part of the Navy as a whole.

Units from every Naval and Marine Corps formation are organized into Task Forces—self-sufficient, with global mobility and able to tackle virtually any military assignment. The sections of U.S. Naval aviation which put to sea therefore have the same operational organization as the U.S. Fleets, which is currently as follows: the First Fleet (Admiral Felix B. Stump, with Vice-Admiral Harold M. Martin as Air Commander) is in the Pacific; the Second Fleet (Vice-Admiral John H. Cassady, with Vice-Admiral Fredk. W. McMahon as Air Commander) is in the Atlantic; the Sixth Fleet (Vice-Admiral Ralph A. Oftsie) is in the Mediterranean and other European waters, and would be placed at the disposal of SACEUR (p. 615) in time of war; and the Seventh Fleet (Vice-Admiral Alfred M. Pride) is in the Far East.

The above Fleets account for a major part of the striking power—particularly the short-range power—of Naval aviation. All the large, long-range aircraft, together with flying boats, transports

Convair R3Y-2 Tradewind (U.S. Navy).



Beech T-34B Mentor (U.S. Navy).

North American FJ-2 Furies (U.S. Marine Corps).

THE WORLD'S AIR FORCES . . .

and lighter-than-air "blimps", are housed at shore bases and attached to operationally supporting or special forces of the Navy, or to NATO commanders.

Carrier-based aircraft are organized into squadrons of upwards of 12 machines, two or more squadrons (with a total strength of from 30 to 100 aircraft, depending on aircraft size and duty, and on the size of the carrier) being organized into functional Air Groups. Shore-based machines are organized into squadrons and wings, in a similar manner to the U.S.A.F. At the present time, the U.S. Navy has 17 Carrier Air Groups, as well as 34 patrol squadrons, 13 transport squadrons, and no fewer than 40 "special-purpose" squadrons (including helicopter, photographic, early-warning and 14 anti-submarine squadrons). The total operational aircraft strength is roughly 9,600, to which should be added 2,500 active logistic aircraft and 2,500 inactive machines, making a grand total of nearly 15,000. Over 4m hours were flown last year.

In the years 1945-50 the U.S. Navy suffered somewhat lean budgets. It was also very seriously hit by the failure of its principal turbojet-builder (Westinghouse) to deliver usable engines on schedule. As a result it is only in the past year or two that it has been possible to set about re-equipping with aircraft fully comparable with those of the U.S.A.F. Meanwhile, paper-planning has gone ahead to work out in detail every facet of operations which might be possible in a future war, employing the very latest types of weapons and machines.

The typical task force, for example, is foreseen as a smaller (but far more potent) force than the task force of 1945. Around a core of three large carriers would be seven all-guided-missile cruisers and two high-speed supply ships. Such a force would be dispersed over some 33,000 square miles of ocean, and would be capable of launching thermo-nuclear attacks against targets 1,500 miles away.

The principal offensive aircraft in the immediate future are both made by Douglas. First there is the A3D Skywarrior, at 70,000lb the largest machine ever designed for carrier operation, yet a type which can be based on any American Fleet carrier. Its principal function is "long-range destruction by horizontal bombing," but it can undertake any form of attack mission, including minelaying. Carrier squadrons of this most capable machine are about to be formed. A very different machine to do the same

Lockheed T2V-1 and TV-1 (U.S. Navy).

task on a smaller scale is the A4D, named Skyhawk. A single-seater, with a non-folding delta wing only 28ft across, the Skyhawk can fly to a target well over 1,000 miles from its carrier, drop a nuclear store and then return; alternatively it can carry out interdiction, anti-shipping and close air support missions. It has a "high subsonic" speed.

Until these highly effective machines enter service in numbers, the strike role will continue to be fulfilled by the evergreen Douglas AD Skyraider, which has been in production since 1945. Skyraiders can do almost any military-air task, and they will remain in front-line U.S. Navy service for some years to come.

The "general-purpose fighter" category has been filled by the McDonnell company, with the F2H Banshee. Larger than most single-seaters, the Banshee has an outstanding range and ceiling, and still equips many squadrons, although the 895th (and last) was built in 1953. To replace the Banshee, McDonnell have developed the F3H Demon, a design which suffered greatly from lack of a suitable engine. Production of the Demon is now at a high rate, and J40-, J71- and J57-powered versions have been prepared, the J57 being the principal engine in present machines. The F3H is a big and heavy fighter, easily supersonic in a dive and carrying an exceptional load of offensive stores. A very similar machine, from the point of view of function if not of appearance, is Chance Vought's F7U Cutlass. This curious tailless machine was all but paralysed by non-availability of its design engine, but squadrons have now been formed. The F7U-3 is serving in both fighter-attack and photographic roles, and is a formidable machine. Like the Demon, it is supersonic in a dive.

The most important Navy fighter is the Grumman F11F Tiger, for which a very large order was recently placed. Powered by a J65 (Sapphire) with afterburner, the Tiger will reach well beyond Mach 1 on the level, and it has a higher all-round performance than any other carrier-based aircraft, with the single exception of the Chance Vought F8U, a prototype of which has now flown. The F8U has a high wing, with variable incidence, and it has an afterburning J57 with more thrust than the Tiger.

Until these promising machines reach the carriers, fighter strength rests with the Cougar and the Fury, both transonic machines based on earlier battle-proven designs. The Grumman Cougar is, perhaps, the fastest machine with a centrifugal turbojet, just failing to reach Mach 1 on the level. The latest (F9F-8) version has passed its carrier evaluation and is now joining squadrons. The North American Fury design is based on that of the Air Force Sabre, and it has resulted in one of the finest carrier-based machines in the world. The latest Furies, FJ-3 and FJ-4, are powered by the J65 Sapphire, and the former is already in service. During its trials at the Naval Air Test Centre the FJ-3 put up some of the best figures ever recorded for any fighter, one section of six flying 704 hr in 29 days. Both Cougar and Fury have standard Navy armament of four 20mm guns, and each can carry a variety of stores under the wing.

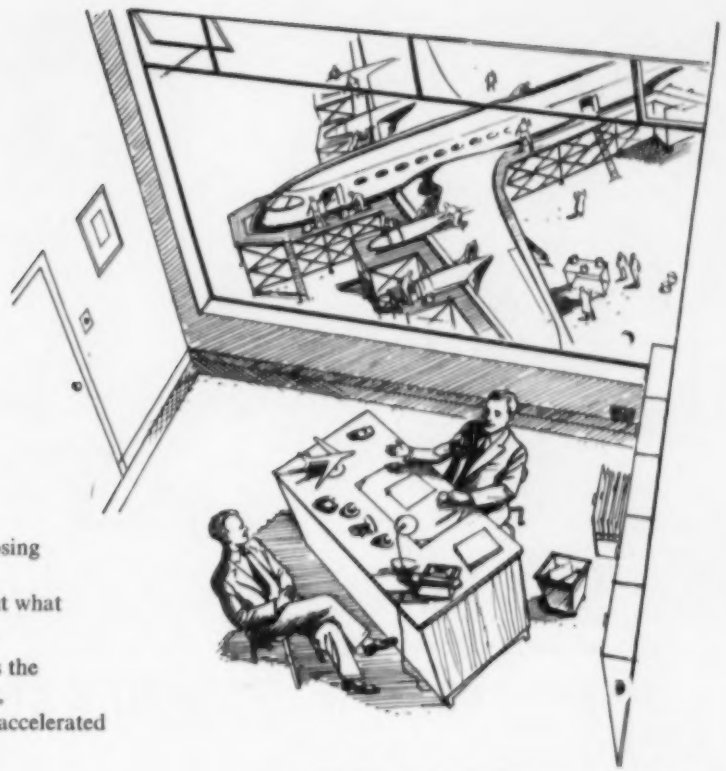
For all-weather defence the U.S. Fleets will, after the summer of this year, lean heavily upon the Douglas F4D Skyray, a compact bat-winged machine which, in spite of its comprehensive equipment and radar fire-control, reaches sonic speed on the level. All U.S. Navy combat aircraft can be flight refuelled. The present tankers are mostly North American Savages—large carrier-based machines with atomic capability, which are also much used for photo-reconnaissance.

The carrier-based strength of the fleet is completed by the early warners (AD-4W Skyraiders), the anti-submarine machines (the standard fixed-wing AS machine is the Grumman S2F Sentinel, a large aircraft with a crew of four, and powered by two piston engines), the utility and rescue helicopters (usually Piasecki HUPs) and special-purpose helicopters. The latter, which include

Sikorsky HR2S (U.S. Marine Corps).

Grumman F9F-5P Panthers (U.S. Marine Corps).

"pH factor? *what's that got to do with aircraft polish?"*



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Flight deck of H.M.S. Warrior taken during exercises in the Japanese Inland Sea

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designs by Bell, Piasecki and Sikorsky, can be used for anti-submarine work (dunking their sonar equipment until they find a target and then "killing" the latter with the Petrel air-to-underwater missile), minesweeping, towing disabled surface craft, rescuing crews from ditched aircraft, and many other duties.

The most-used shore-based machine is the Lockheed P2V Neptune, which is serving in many patrol squadrons and is also used on met. reconnaissance and other missions. The latest Neptunes incorporate improvements, one of which is the fitting of booster turbojets beneath the wings. Neptune equipment includes search and strike radars, magnetic-airborne-detection gear, a searchlight and a variety of defensive and offensive armament.

Other patrol squadrons fly the Martin P5M Marlin, a very large twin-engined flying boat, and earlier Martin types including the PBM Mariner and P4M Mercator. Blimps (non-rigid airships), such as the Goodyear ZS2G family, are also widely used on anti-submarine and other ocean patrol duties. The latest Blimps carry early-warning radar, with a dorsal height-finder.

The latter equipment has previously been carried only by such special-purpose machines as the Skyraider and the great Super Constellation. The latter, with a crew of 31 (Navy) or 32 (Air Force) is used by both American Services as a high-flying "picket" and command post, carrying the most powerful airborne radar equipment in the world. Well over 100 are in service all round the U.S.A. A subsidiary task of such machines is the collection of aerological information, or "hurricane hunting".

A particularly interesting machine, the prototype of which is about to fly, is the Martin P6M SeaMaster flying boat. This aircraft is powered by four afterburning turbojets, and it has aerodynamic features which clearly indicate a Mach=0.9+ performance. Although the crew compartment is fully pressurized, the SeaMaster is equipped for low-altitude tasks, including minelaying; in lieu of mines, a large camera installation can be carried in the weapons bay in the hull.

No lack of inventiveness can be discerned in the Bureau of Aeronautics or the American industry when it comes to Naval aircraft design. Very much attention has been paid to the development of vertical-takeoff fighters, and two turboprop prototypes, by Lockheed and Convair, have been flown and have achieved transition from vertical to horizontal flight. Work is going ahead with jet-powered developments and official opinion in the Navy seems to be that "many, many uses" will be found for the right v.t.o. machine when it arrives. Such a machine would, in the first instance, be a very-high-performance intercepter.

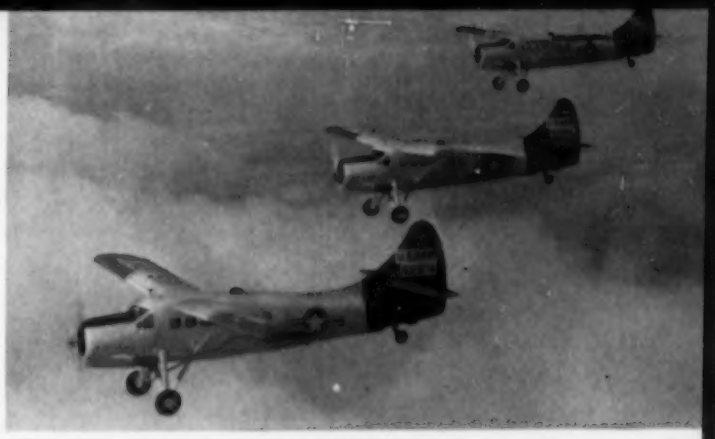
Aircraft carriers themselves have, of course, benefited from the British-designed angled deck and steam catapult, and these features are rapidly being incorporated in every Fleet carrier. At present, the bulk of the carrier strength rests in the three great ships of the *Midway* class and the 24 *Essex* and modified-*Essex*-class carriers. Their full-load displacements range from 38,000 to 62,000 tons and they can embark 100 fighter-size aircraft. Most of these ships have battle experience, either in World War 2 or in Korea. Five "giant carriers" of the *Forrestal* class are building, and the first of these 60,000-ton ships should commission next year. At a cost of $200m each, these carriers have come in for some considered criticism, but the Navy believes that its task force concept will prove sound in any type of future war.

The United States Marine Corps

ALTHOUGH THE paper strength of U.S.M.C. aviation remains at three Air Wings—one for each Marine Division—the number of combat aircraft on hand increased over 40 per cent during the 1953 and 1954 financial years, and each Air Wing now comprises no fewer than nine fully operational squadrons.

The Marine Corps has no use for strategic aircraft, and the bulk of its strength is vested in fighter/bombers and helicopters. Their operations are entirely subordinated to those of the Marine ground troops and close-support is the dominant role. One of the major Marine tasks is the establishment of beach-heads on enemy coasts, and the Corps has evolved a form of "vertical envelopment" which starts with the neutralization of opposition by atomic weapons. Assault troops would then be brought in by helicopter, "leap-frogging" the radio-active area, with protection provided by Terrier ground-to-air missiles (launched from special portable ramps) and Marine fighters armed with Sparrow air-to-air missiles. This technique has already been successfully simulated at the Yucca Flats range in Nevada.

Until recently the Corsair fighter/bomber was a major U.S.M.C. type, but the multi-purpose Skyraider is now the only piston-engined combat aircraft in squadron service. Equipment includes such aircraft as the Grumman Panther and Cougar, the North American FJ-2 Fury and the McDonnell F2H Banshee. In addition, the two-seat (side-by-side) Douglas Skyknight is employed as a night and all-weather fighter armed with four Sparrow missiles. For future equipment the Marine Corps is to receive a number of the latest types of Navy fighters. Logistic transport squadrons



de Havilland Canada U-1 Otters (U.S. Army).

de Havilland Canada L-20A Beaver (U.S. Army).

Piasecki H-21C Work Horse (U.S. Army).

Sikorsky H-19C (U.S. Army).

(Below) Bell H-13 (U.S. Army).

THE WORLD'S AIR FORCES . . .

are equipped with the Fairchild R4Q Boxcar.

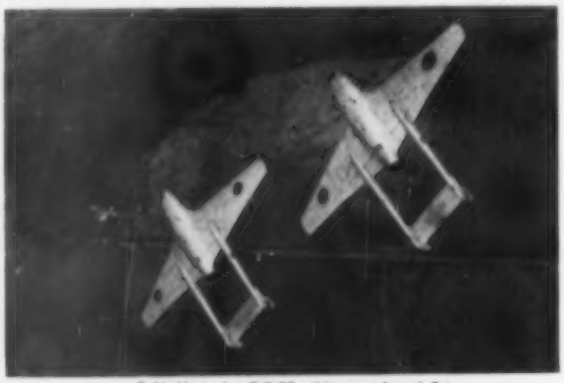
For their vertical-envelopment technique the Marines required a helicopter capable of lifting the greatest possible load while having dimensions compatible with the limitations imposed by operation from small escort carriers. To the Corps' own specification has been developed the Sikorsky HR2S (S-56), which can uplift two complete sections totalling 26 men, with their own personal equipment and weapons. In spite of their high unit cost, these helicopters will be available in considerable strength during the coming year. In addition, the single-engined Sikorsky HUS (S-58) is being purchased for general transport and utility purposes. Meanwhile, the present Bell HTL and Sikorsky HO5S small utility helicopters are to be replaced with the Kaman HOK, which is expected to prove a most valuable aircraft.

The United States Army

ALTHOUGH THE Army needs enormous air-lift potential for making its strength available in all parts of the globe, it is at present limiting its own purchases to small aircraft. All the heavy logistic work is done by the Air Force and Navy, and it is foreseen that these services—one, or both—will have to provide for very much greater capacity in the future, with such aircraft as the Douglas C-132 (see data table, p. 637). At the present time, the U.S.A.F. has stated that it could not effectively airlift one complete Army infantry division, and pressure for a larger airlift is growing.

The Army's own aircraft (bought through the U.S.A.F.) total 3,600, and are roughly half fixed-wing and half helicopters. In the close-support role, these aircraft operate in a manner tailored to the dispersal requirements of nuclear warfare. For example, the classic ground reconnaissance unit is to be replaced this summer by new formations divided into three parts: a first (observation) element, equipped with light helicopters; a second (assault) force, capable of fighting a sustained action, equipped with larger helicopters; and a third armoured force similar to those now used. In the reconnaissance role, the Army uses Bell, Hiller and Piasecki helicopters; its large helicopters are currently the utility Sikorsky H-19, the Piasecki H-21 and—shortly—the Sikorsky H-34 and H-37. In the 1955 financial year $69m was spent on aircraft; in 1956 the budget allows $118m, most of the increase being for the big H-37 (S-56) helicopter, which can lift well over 10,000 lb.

Fixed-wing machines are various, but the more important types are the Cessna L-19 Bird Dog liaison and observation machine, the de Havilland Canada L-20 Beaver utility machine and the 14-seat Otter, designated U-1 and ordered to a total of 90 for many support and specialized functions. The only twin at present used is the Beech L-23B (Twin Bonanza) employed as a command vehicle and "staff car", but the twin-jet Cessna T-37 (Air Force primary trainer) is also the subject of a service-test order, for observing the fire of ground-to-ground missiles, such as Honest John.



D.H. Vampire F.B.52s (Venezuelan A.F.).

English Electric Canberra B.2s (Venezuelan A.F.).

(Below) Lockheed T-33s (Yugoslav A.F.).

URUGUAY

Uruguayan Military and Naval Aviation

INCLUDED UNDER the title Uruguayan Military Aviation is a Naval Air Service, equipped with Grumman Hellcats, Grumman Avengers and Chance Vought Kingfishers. A few North American Mitchells serve as shore-based bombers, and for transport there are Douglas Dakotas and Curtiss Commandos. Trainers are North American AT-6s, Beechcraft AT-11s and Fairchild PT-19s.

VENEZUELA

The Venezuelan Air Forces

THESE AIR Forces (invariably referred to in the plural) are administered by the Ministry of National Defence at Caracas. The Defence Minister, Colonel Oscar Mazzei Carta, announced early this year that negotiations had been opened for the purchase of de Havilland Vampires and Venoms. He added that his country wanted to buy British and American military jet aircraft to strengthen its Air Forces. Already Vampire F.B. 52s and English Electric Canberra B.2s were numbered among the operational types and it was reported last year that Venezuela was seeking to acquire twenty-two Republic F-86Fs from America.

American equipment supplied in post-war years has included Republic Thunderbolt fighter/bombers, North American Mitchell bombers, Douglas Dakota transports, and North American AT-6 and Beechcraft AT-11 trainers.

Principal commanders: C-in-C., Venezuelan Air Forces, Colonel José Saúl Guerrero; Chief of Air Staff, Colonel Jesús María Castro León.

YUGOSLAVIA

The Yugoslav Air Force

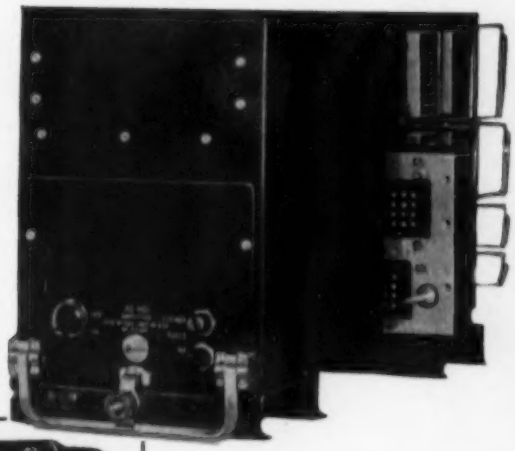
SQUADRONS OF Republic F-84G Thunderjet fighter/bombers represent Yugoslavia's principal offensive and defensive strength. For training pilots to fly these machines there are Lockheed T-33As. Piston-engined fighters are Republic F-47D Thunderbolts and de Havilland Mosquito night fighters, and the Yugoslav-built S-49, a version of the Yak 9, serves in the fighter reconnaissance role. Trainers include the nationally-built Type 214 and Type 522, North American Harvards and Aero 2s (some on floats). Under the Mutual Aid Programme the U.S.A.F. has supplied Westland-built Sikorsky S-51 helicopters to the value of about £357,000.

Commanding general is Lt-Gen. Zdenko Ulepic.

Ikarus S-49C (Yugoslav A.F.).

Aero 2D (Yugoslav A.F.).

Aircraft Intercommunication



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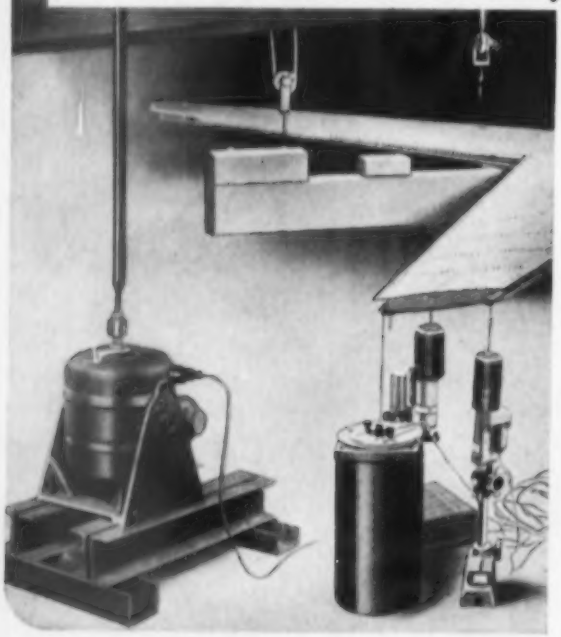

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The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

The Mint

I RECENTLY returned from a tour abroad and on going through a collection of reviews of T. E. Lawrence's book *The Mint* I came upon the one that was published in *Flight*, written by Wing-Commander R. C. O. Lovelock. I would like to express my admiration for it. *The Mint* is a very difficult book to judge and review, but in my opinion Wing-Commander Lovelock's is one of the most discerning and best-balanced of all the reviews I have read.

As regards the Uxbridge Depot of the R.A.F., I heard much about this from numerous people who knew it during the 1920s—and the general balance of evidence coincided with his account of it in *The Mint*. At that time Uxbridge was modelled on the methods prevailing at the Guards Depot at Caterham—methods that were based on the idea that the recruit must be "broken" in order to be effectively remoulded into the desired pattern.

Wolverton Park, Buckinghamshire. B. H. LIDDELL HART.

Boundary-layer Control

IN your article in *Flight* dated April 22nd, on "Boundary-layer Control for Lockheed T2V-1" you accurately described the method by which control of the boundary-layer is obtained, but you wrongly say that such control is to maintain laminar flow over the flaps and so prevent breakaway. The attachment of flow over a flap by air ejection is what is termed "the Coanda effect" and such an effect does not depend on maintaining laminar flow.

The ejection of a high-velocity stream of air into a laminar boundary-layer would most certainly make it become turbulent; and since, in the case of the T2V-1, the boundary layer just before the point of ejection would be turbulent anyway, it would be quite impossible to have laminar flow over the flaps.

As there has been much confusion as regards boundary-layer control for obtaining high lift and boundary-layer control for obtaining low profile-drag I think it would be timely if I pointed out the difference. Boundary-layer control for low profile-drag depends on maintaining laminar flow over as large an area of the aerofoil surface as possible in the cruise condition so that the friction drag is reduced to a minimum. This type of control is obtained by sucking away part of the boundary-layer over the complete surface. Due to technical difficulties, such a control is not operated at low altitudes. Boundary-layer control for high lift is used for decreasing landing and take-off distances and as previously stated such control does *not* depend on maintaining laminar flow over the wing and flap.

London, N.W.2. F. GERRIE WILLOX.

Sky Riddle

WITH reference to the letter from Mr. D. Nash concerning the "inexplicable phenomena" which he has witnessed, I and several of my friends have also seen the black lines to which he referred. The aircraft, B-47s, were flying parallel to the lines, which were increasing in length at the same rate as the condensation trails caused by the aircraft. The end of each line was a considerable distance in front of the aircraft. The aircraft then went into a gentle turn to port, thus crossing the lines, which also started to turn to the left, though, of course, still the same distance in front of the B-47s. The position of the sun at the time would have caused the shadow of each trail to fall on the thin cloud in the same position in which the black lines were observed. I conclude, therefore, that the black lines were, in fact, shadows, and the occurrences which confounded Mr. Nash's theory were purely coincidental.

Farnborough, Hants. F. C. CARBURY.

I BELIEVE that the dark lines in the sky, seen in conjunction with contrail-forming aeroplanes by your correspondent, Mr. D. Nash, were in fact the shadows of the contrails made visible by the haze which he says was present at the time. If by "haze" Mr. Nash means very thin cirrus, or cirro-stratus cloud, and the aircraft were above this haze layer, then this would fit the case very well. The shadows of the contrails would be projected on to the mist layer from above and, the aircraft moving up from the south with the sun behind them (1230 hr) would be preceded by their trail shadows.

The distance by which the shadows preceded the aircraft would depend on the height of the machines above the mist layer and the elevation of the sun. I think it would be quite possible for cirro-stratus to be both thin enough to allow aircraft to be visible through it and yet have sufficient substance to show shadows.

The fact that other aircraft coming from a different direction appeared to turn and follow the shadows I would put down as coincidence, or at least to the fact that they were using the contrails as a guide to the direction taken by other members of their squadron. (Incidentally, do fighter pilots ever use this method of locating each other when they have become widely scattered in the vast spaces of the sky, or do they rely on some more prosaic method, such as radar?)

Oxford. B. G. HOWLAND.

Camels Preserved

TO J. M. Bruce's excellent articles on the Camel, may I add two minor footnotes? Namely, that H508 is still with us in the Nash Collection (with its Anzani, was this G-EBER?) and that Lt. S. D. Culley's 2F.1 is preserved in the Imperial War Museum, the serial being F3043.

Wallington, Surrey. PETER G. COOKSLEY.

THE adequacy with which your contributor J. M. Bruce has dealt with the history of the Sopwith Camel is as remarkable as have been his earlier subjects of this series.

In recording the astonishing exploits of Capt. Armstrong he does not mention that this pilot was stationed for a period at Fairlop, when on Home Defence Duties. It was here that I saw Capt. Armstrong flying the Camel in his own spectacular and inimitable manner.

An article entitled "Artistry in the Air" by Maj. Oliver Stewart, M.C., A.F.C., appeared in the March 1930 issue of *Motor Sport*, which, together with an illustration of a Camel inverted at low altitude and captioned "A 'Flick Roll' Ten Feet Up!" can only be ascribed to Armstrong, albeit Oliver Stewart merely remarks

FORTHCOMING EVENTS

May 14. British Interplanetary Society: Short paper evening.
May 17. Aircraft Golfing Society: Match v. R.A.E.
May 19. R.Ae.S: The 43rd Wilbur Wright Memorial Lecture: "Flight Control," by Dr. C. S. Draper, F.I.A.S.
May 20. Institute of Navigation: "Automatic Dead Reckoning Instruments," by H. C. Pritchard.
May 21-23. Zoute Aviation Club: International rally.
May 27. Royal Aircraft Establishment: Senior Staff Mess Ball.
May 29-30. Aero Club of Ireland: Flying Display.
May 29-30. S.M.A.E.: British National Model Aircraft Championships, R.A.F. Station, Waterbeach.
May 30. R.Ae.C.: Second National Air Races meeting (in conjunction with S.S.A.F.A. air display), Yeadon.
May 30. Royal Netherlands Aero Club: International Air Display: Ypenburg.
May 30-June 10. Canadian International Trade Fair and Air Show, Toronto.
June 1-11. Aluminium 1955 Exhibition: Royal Festival Hall, London.
June 1-11. British Plastics Exhibition and Convention: Olympia, London.
June 7-15. French Aero Club: F.A.I. 50th Anniversary Rally, Paris.
June 4-5. Royal Air Forces Association: Annual Conference.
June 7-10. Institute of Transport: 1955 Congress, Southport.
June 10-19. Paris Aero Show.
June 11. R.Ae.C.: Third National Air Races meeting, Bristol.
June 11. Royal Air Forces Association: Air Display, R.N.A.S. Sydenham, Belfast.
June 11. Aircraft Golfing Society: Match v. Racing Club de Paris, La Boulie, Paris.
June 17-24. F.A.I.: General conference.
June 18. R.N.A.S. Eglinton, Northern Ireland: Air Day.
June 18. R.N. Electrical School, H.M.S. "Ariel," Worthy Down, Winchester, Air Day.
June 20-July 1. I.A.S. and R.Ae.S.: Fifth Anglo-American Aeronautical Conference, Los Angeles.
June 24-27. Palermo Aero Club: Seventh Tour of Sicily.
June 26. Northern Heights M.F.C.: Model Flying Gala Day, R.A.F.
June 25. R.N.A.S. Culdrose, Helston, Cornwall: Air Day.
June 25. R.N.A.S. Stretton, Warrington: Air Day.
June 28. Air League of the British Empire: Air Ball, Dorchester Hotel.
July 2. R.N.A.S. Arbroath, Angus, Scotland: Air Day.
July 2-4. R.Ae.C.: Members' La Baule rally.
July 7-9. Royal Aircraft Establishment, Farnborough: 50th Anniversary Celebrations.
Sept. 5-11. S.B.A.C. Show, Farnborough.

R.Ae.S. Branch Fixtures (to May 23)

May 16, *Halton*, Film Show. May 18, *Hatfield*, Annual general meeting. May 23, *Halton*, "Dynamic Heating (the Heat Barrier)," by S/L. P. C. Cleaver.

CORRESPONDENCE . . .

that "many members of the R.F.C. will guess his name" without actually quoting it. The first time I saw Armstrong loop straight off the grass at Fairlop and "flick roll" between the Bessoneau hangars I was horrified and incredulous; but seeing these and other equally frightening exploits repeated with exactitude left only respect and admiration for his complete mastery. In 1930, Oliver Stewart commented that "Before he died in France, this pilot set a standard in aerobatics which in artistry and spectacular effect has never since been surpassed." I believe that to be as true today as it was then. Of the countless exhibitions I have seen in the ensuing years, only Udet remotely offered comparison.

Finally, may I express the earnest hope that the entire series of J. M. Bruce's articles on the military aircraft of the 1914-1918 war will be published in book form.

Ryde, Isle of Wight. F. A. KAPPEY.

Westland History

I FOUND your recent history of Westlands intensely interesting. There seemed to be no mention of the fact, but I believe one of the Pterodactyls (I forget which one) is still in existence—or was not long ago. I am almost certain that I saw it strung up to the roof of one of the hangars at Farnborough—or am I dreaming?

Whilst in nostalgic mood, I often gaze on what I believe is the sole survivor of the Miles Martlets (G-AAYX) which still reposes in the corner of a hangar at Shoreham—minus engine but otherwise outwardly complete.

I wonder if some enthusiast will ever push this most interesting little aeroplane into the sky again. As a youth I spent many hours watching the antics of these delightful little biplanes. I seem to remember that one of its most doughty protagonists was one F/O. H. H. Leach, who flew with verve and skill.

Jolly good luck to your admirable journal!

Worthing, Sussex. DOUGLAS F. TAYLOR.

THE AERONAUTICAL BOOKSHELF

"Expedition to Earth," by Arthur C. Clarke. Sidgwick and Jackson, Ltd., 1 Tavistock Chambers, Bloomsbury Way, London, W.C.1. Price 8s 6d.

ANYONE who has read Arthur Clarke's previous science fiction novels will know what to expect in this collection of short stories. They were beautifully written, with plenty of suspense, an obvious basis of scientific knowledge and, in some cases, a moral. For those who like space-travel stories, there is a struggle for survival between two men in a rocket, deep in space, with sufficient oxygen for only one to live. But the most thought-provoking and appealing little story of all concerns the scientists of Venus, many years in the future, who discover a unique record of long-extinct life on Earth. How could they be expected to appreciate the real significance of the words that follow a film of the incredible adventures of colourful Earthlings with big mouths and enormous ears—"A Walt Disney Production"?

"The First and the Last," by Adolf Galland, Methuen and Co., Ltd., 16 Essex Street, London, W.C.2. Illustrated. Price 18s.

THIS is the story of one of Germany's outstanding fighter leaders before and during World War II, and it is also yet another piece in the jig-saw puzzle which, when complete, will give the full picture of the fantastic hierarchic card-house which was Nazi Germany. Galland was a part of German aviation from the time of the tremendous and genuine enthusiasm which marked the rise of Nazism and the rebirth of German self-respect, up to the incredible and cataclysmic military collapse which signalled the fall of Nazism, though not the demise of German courage and energy.

It is difficult to gain a valid impression of the writer from a translation of his work, and one cannot help feeling that this particular translation could have been helped with a little more technical knowledge, and perhaps a little more time and consideration. But the story rings true, and Galland seems to pull no punches.

Galland first flew with the growing German gliding movement in the early Nazi days and, after leaving school, passed the extremely tough entrance tests for Lufthansa. With this company he was given secret military flying training, and joined the first squadrons of the new Luftwaffe. During the Spanish civil war he was posted to the German Kondor Legion and established rather against his will, a reputation as a ground-attack pilot. His true bent was towards pure fighters.

It was during and immediately after the Battle of Britain that he began to see Goering regularly and to argue with him as few others dared; and he then began to realize that the whole basis of the strategic and tactical employment of the air force was founded on wrong or outmoded concepts.

Galland was chief of the fighters for several years and saw the whole fantastic sequence of orders and counter-orders, and "intuitions," which were largely responsible for depriving the Germans of vital air superiority. One fact that does emerge very clearly is that despite their "poor relation" status in the German Air Force the fighter pilots did as well as (and in many cases very much better than) anyone except Hitler or Goering could have hoped. The fighter force was directly responsible for two major Allied strategic bomber campaigns against the German aircraft industry—and this when Allied intelligence reports had it that the fighter resistance had been almost totally destroyed. Though its efforts necessarily became feebler as total national collapse approached, it never ceased to be a thorn in the flesh of the Allied bomber formations. For this Galland was as much responsible as the fighter pilots themselves.

At the end Galland fell into disgrace and was sent back to active fighter flying, this time in command of one of the first Me262 intercepter squadrons. By the time the end came he was in hospital after being shot down, and he realized that years of work on behalf of the fighters were lost in the collapse just when real results were beginning to show.

Galland, who has been a consultant to the Argentine Air Force since the war, has entered the news again, for it was recently rumoured that he might become the commander of the new German Air Force. One cannot help feeling that this time he would make some pretty firm conditions before accepting the post, and that the structure of the new force would differ fairly radically from that of the war-time Luftwaffe.

OTHER BOOKS RECEIVED

Down in the Drink, by Ralph Barker. Chatto and Windus, Ltd., 40-42 William IV Street, London, W.C.2. Price 12s 6d.

Flying Model Aircraft, by D. J. Laidlaw-Dickson. Frederick Muller, Ltd., Ludgate House, 110, Fleet Street, London, E.C.4. Price 6s.

Gas Turbine Series, Vol 2: Some Fundamentals of Combustion, by D. B. Spalding, M.A., Ph.D., A.M.I.Mech.E. Butterworth's Scientific Publications, 88 Kingsway, London, W.C.2. Price 40s.

Some Recent Appointments

A RECENT change in the board of the British Thomson-Houston Co., Ltd., has been announced. Mr. J. N. MacDonald, B.A., A.M.I.E.(India), executive director of the B.T.H. Export Co., retired at the end of April and Mr. H. E. Wethered has been elected to the board to fill the vacancy.

* * *

The Plessey Co., Ltd., announce the appointment of Mr. C. D. H. Webb as director of Plessey International, Ltd.

* * *

Mr. Frank A. Hurst, chairman of Titanium Metal and Alloys, Ltd., of Sheffield, and chairman and managing director of Samuel Osborn and Co., Ltd., has been elected president of the Sheffield Chamber of Commerce.

* * *

Mr. R. J. Dixon, A.M.I.P.E., has been appointed a director of Wickman, Ltd., machine tool manufacturers. Mr. Dixon, who is chief engineer of the company, joined the firm in 1929 and was appointed a special director in 1953.

* * *

Following the recent statement by Mr. G. H. Dowty that the educational activities of the Dowty Group were to be extended comes news of the appointment of Mr. K. J. Hume as chief education officer. Mr. Hume has held posts with the de Havilland Aircraft and Engine companies and is at present head of the National College of Horology. He will take up his new duties in August.

* * *

A well-known Canadian aviation journalist, Mr. Ross Willmot, editor of *Canadian Aviation*, has been appointed director of public relations to the Hunting Group's Canadian companies. He is director of special events in connection with the Canadian International Trade Fair and Air Show which is being held at Toronto from May 30th to June 10th.

* * *

The appointment of Mr. R. L. "Deacon" Sansbury as director European operations has been announced by the Martin Company, Baltimore. He will be responsible for customer relations with U.S. and NATO military, governmental, and civilian agencies and will assist in the export sales programme of the company. Mr. Sansbury joined the Martin organization as a test pilot in 1940 and since 1948 has been Air Force sales manager. His address in Britain is 78 Buckingham Gate, London, S.W.1.

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Agents in Australia: Aeronautical Supply Co. Pty. Ltd., 210 Victoria Street, MELBOURNE, Victoria.

Agents in Spain: Senor Ramon Escario, Nunez de Balboa, 29, MADRID.

Agents in Egypt and Syria: T. G. Mapplebeck, 48, Sharia Abdel-Khalek Sarwat Pasha, CAIRO, Egypt.

Agents in Israel: Curt Israel, P.O.B. 1999, TEL AVIV.

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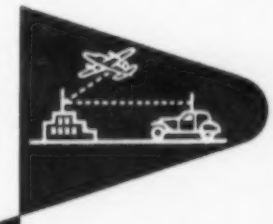

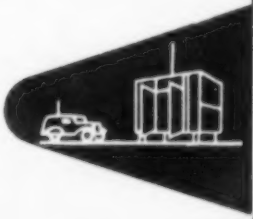

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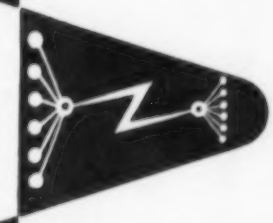

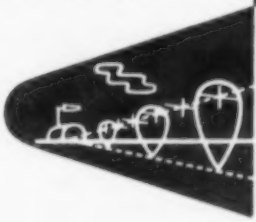

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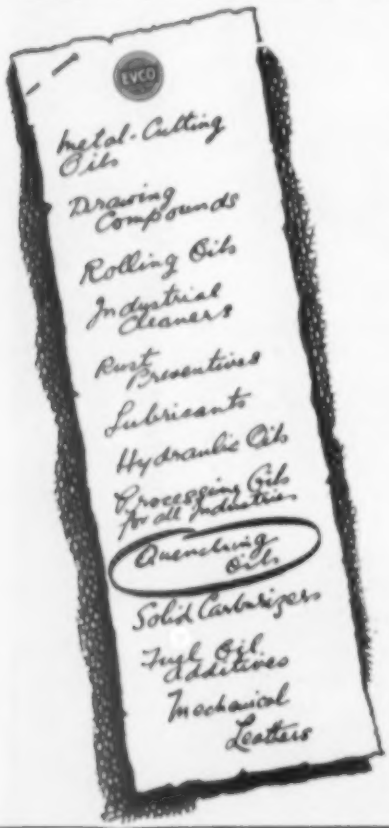

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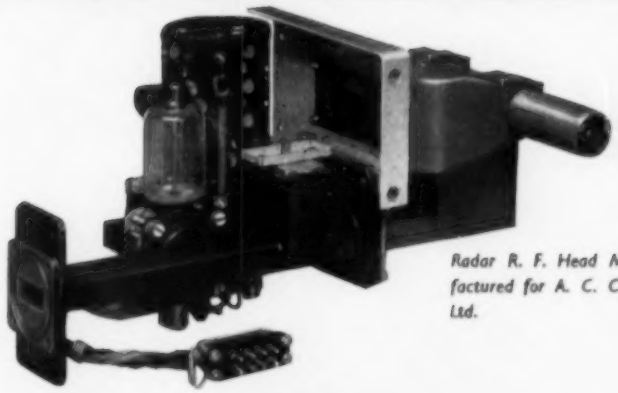

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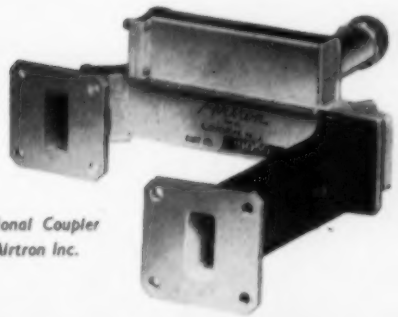

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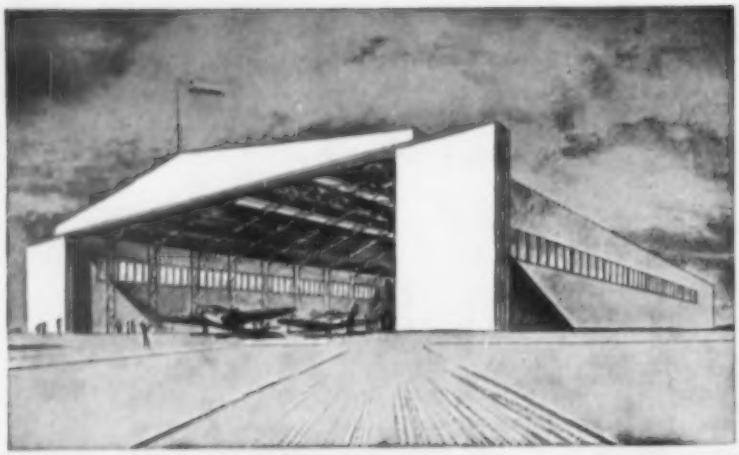

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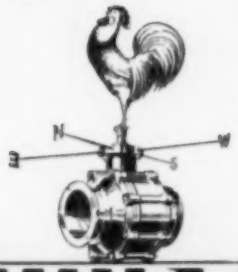

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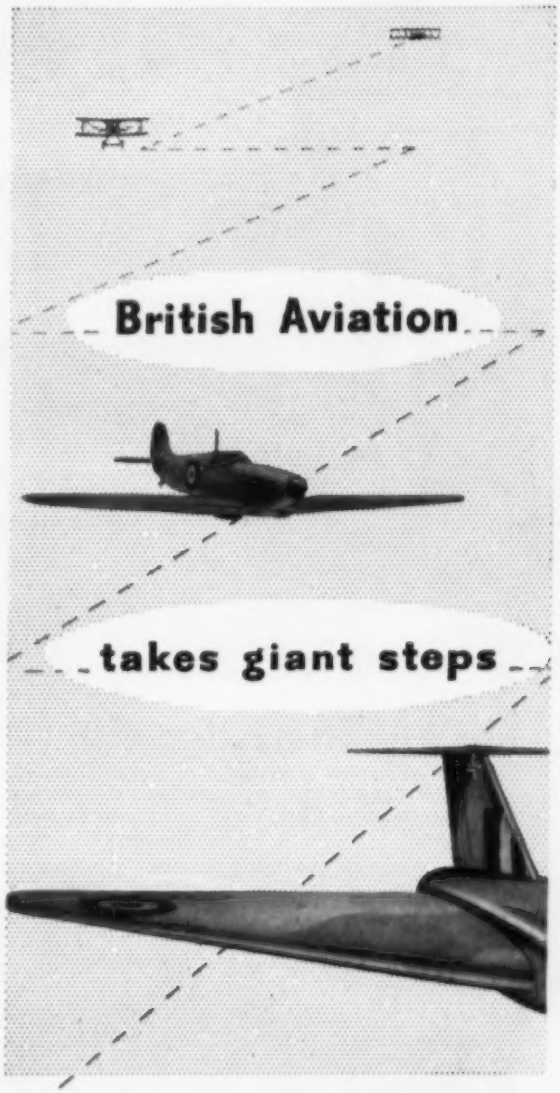

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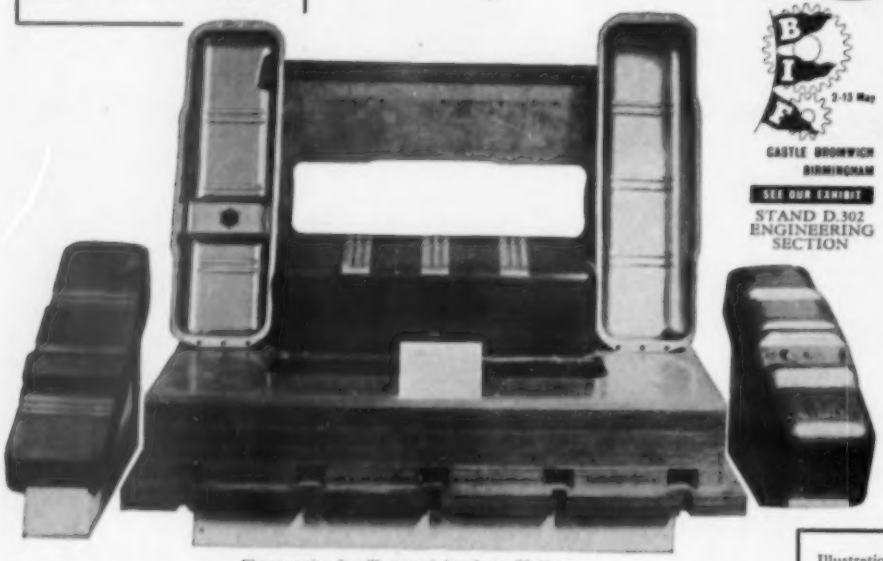

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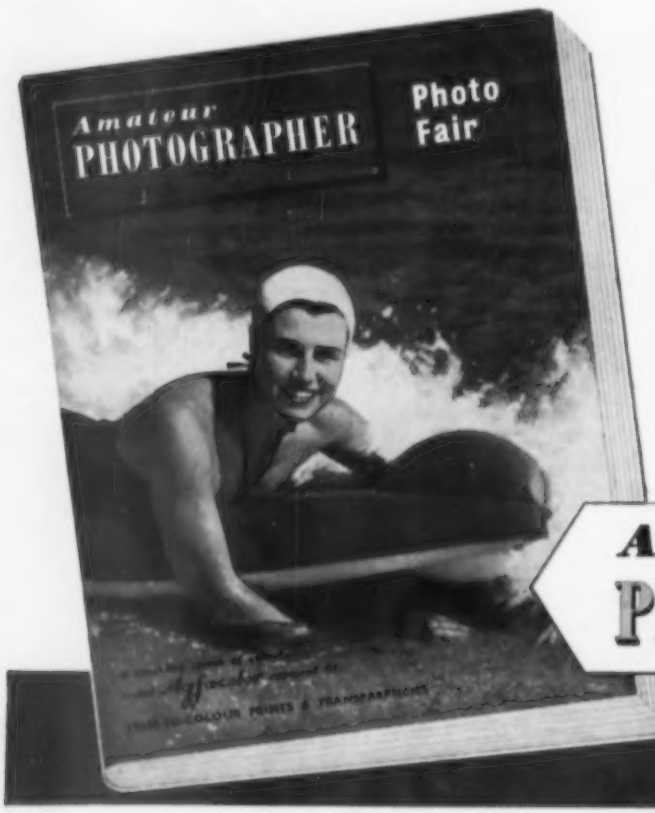

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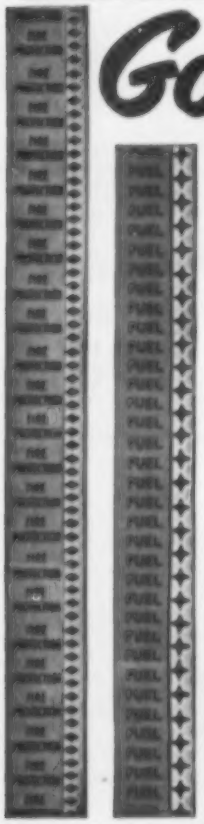

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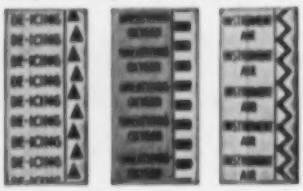

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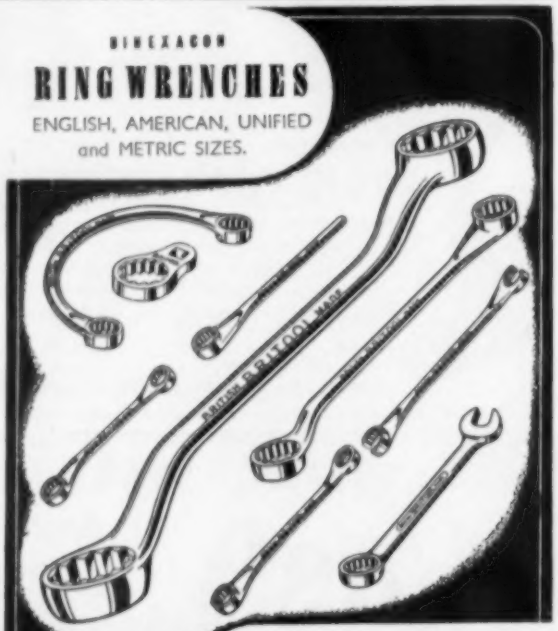

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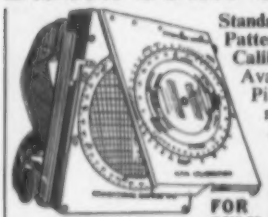

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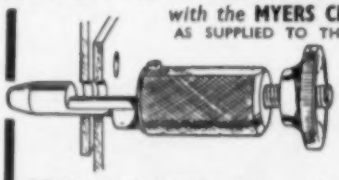

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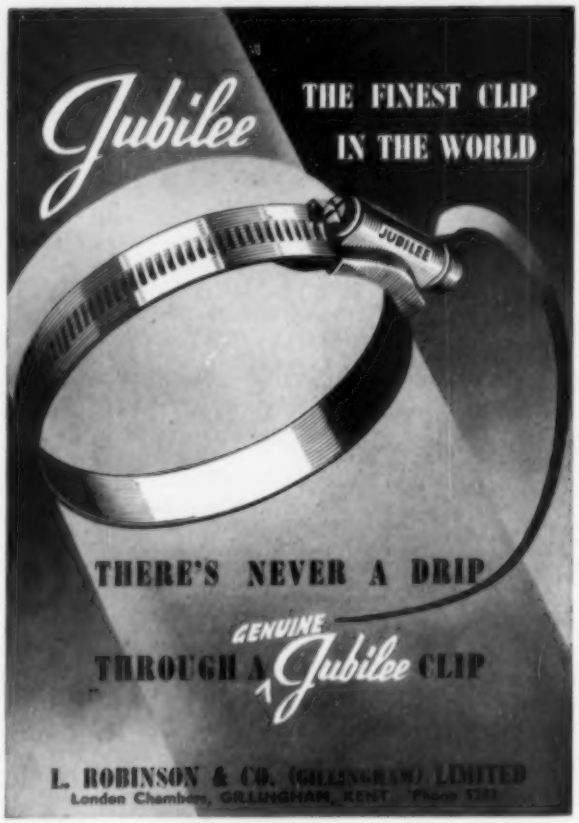

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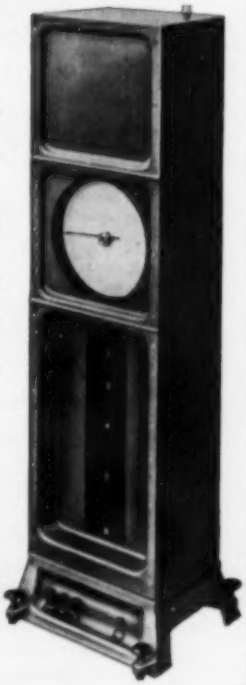

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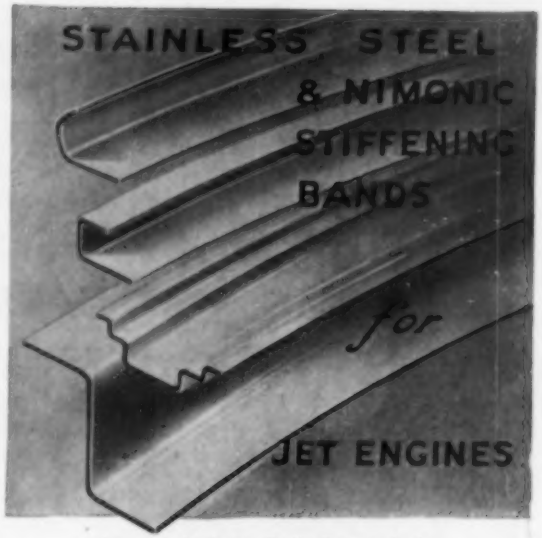

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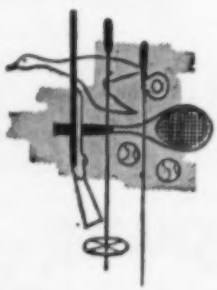

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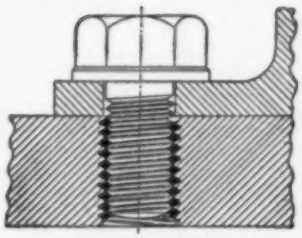

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:

FROM British European Airways Corporation of Keyline House, Ruislip, Middlesex.

APPLICATION No. 475 for a Helicopter Service with Westland S.55 and Bristol 171 Helicopter aircraft and later possibly with Bristol 173 Helicopter aircraft, for the carriage of passengers, supplementary freight and mail between London Airport and Southampton at a frequency of up to five services weekly increasing further according to traffic demand for a period of 10 years commencing 14th June, 1955.

APPLICATION No. 476 for a normal scheduled service with Viscount, Elizabethan and/or Pionair aircraft for the carriage of passengers, supplementary freight and mail between London Airport and Catania with intermediate traffic stops at Nice and/or Rome and/or Naples at a frequency of up to three services weekly increasing further according to traffic demand for a period of 10 years commencing 1st October, 1955.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [3703

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METEOROLOGICAL Office, Scientific Officers. The Civil Service Commissioners invite applications for permanent posts. Early application is advised. The duties include research in atmospheric physics, covering the study of cloud structure, synoptic and dynamical meteorology, large and small scale diffusion and turbulence, climatology, and development of instruments. There is a limited number of posts for forecasting work at the more important centres. Successful candidates will be given a course in meteorology before being assigned to a research or forecasting establishment for further training and experience. In some instances candidates with national service obligations can be commissioned in the R.A.F. for forecasting duties at R.A.F. stations. Further information may be obtained from the Director, Meteorological Office, (M.O.10), Air Ministry, Kingsway, London, W.C.2.

CANDIDATES must be between 21 and 28 during 1955 (up to 31 for permanent members of the Experimental Officer class.) They must have (or obtain in Summer, 1955) a First or Second Class Honours degree preferably in physics or mathematics. Salaries £492—£885 (London rates for men; somewhat lower in the provinces). Women's scales are somewhat lower than men's but subject to improvement under equal pay scheme. Opportunities for promotion to Senior Scientific Officer (£1,010—£1,185), and higher posts.

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SITUATIONS VACANT

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	Page
Abbey Panel and Sheet Metal Co., Ltd., The	7
Aeroservices, Ltd.	95
Aero-Spares Co.	86
Air Engine Services (U.S.-U.K.), Ltd.	94
Aircraft Materials, Ltd.	68
Airscrew Co., and Jigwood, Ltd., The	81
Air Service Training, Ltd.	82
Air Trainers, Ltd.	91
Airwork, Ltd.	42
Alvis, Ltd.	53
Amalgamated Wireless (Australasia), Ltd.	30
"Amateur Photographer"	84
Armstrong-Siddeley Motors, Ltd.	54, 97
Armstrong Whitworth Aircraft, Ltd., Sir W. G.	98
Atlantic Aviation Inc.	95
Attewell and Sons, Ltd., B.	95
Aviation Developments, Ltd.	12
Bardolph and Partners, Ltd., J. F.	86
Bellman Hangers, Ltd.	80
Blackburn and General Aircraft, Ltd.	41
B.R.D. Co., Ltd.	59
Bristol Aeroplane Co., Ltd., The Cover iv, 90, 97, 98,	99
British Thomson-Houston Co., Ltd., The	74
Brown Corporation (Sales), Ltd., David, The	66
Burnley Aircraft Products, Ltd.	10
Canadair, Ltd. 61,	92
Canadian Car and Foundry Co., Ltd.	57
Central Office of Information (R.A.F.)	50
Chain Belt Co.	91
Chinn and Co., Ltd., J. S.	38
Computing Devices of Canada, Ltd.	36
Corner and Co., Ltd., G.	82
Counting Instruments, Ltd.	88
Cox and Co., John F.	90
Cross Manufacturing Co. (1938), Ltd.	95
Decca Navigator Co., Ltd., The	29
Decca Radar, Ltd.	32
De Havilland Aircraft Co., Ltd., The	41
De Havilland Aircraft of Canada, Ltd.	22
De Havilland Engine Co., Ltd., The	71
Derby Aviation, Ltd.	93
Docker Brothers	15
Douglas Equipment, Ltd.	23
Dunlop Rubber Co., Ltd. 62-63	
Elliot Equipment, Ltd.	9
E.M.O. Instrumentation, Ltd.	87
English Electric Co., Ltd., The 11, 49,	97
Equator Wheels and Sections, Ltd.	90
E.R.S., Ltd.	85
Exector, Ltd.	72
Fairey Aviation Co., Ltd., The	43
Ferranti, Ltd.	96
Fibreglass, Ltd.	82
Firth and John Brown, Ltd., Thos.	5
Fokker Aircraft	27
Folland Aircraft, Ltd.	73
Gloster Aircraft Co., Ltd. 47,	96
Goodmans Industries, Ltd.	68
Goodyear Tyre and Rubber Co. (Great Britain), Ltd., The	51
Gosheron and Co., Ltd., John	86
G.Q. Parachute Co., Ltd.	26
Handley Page (Reading), Ltd.	96
Harper Aircraft Co., Ltd., C. E.	95
Headquarter and General Supplies, Ltd.	95
Helliwells, Ltd.	69
High Duty Alloys, Ltd. Cover ii	
Hindustan Aircraft, Ltd.	39
H.M.L. (Engineering), Ltd.	17
Hobson Ltd., H. M.	75
Hordern Richmond (Sales), Ltd.	84
Ilford, Ltd.	18
Iliffe and Sons, Ltd.	83
Instrument Associates	76
I.V. Pressure Controllers, Ltd.	88
Jablo Plastics Industries, Ltd.	86
Jenks Brothers, Ltd.	85
Jet Tanks, Ltd.	88
Lewis, Ltd., D.	93
Light Soldering Developments, Ltd.	93
Lucas (Gas Turbine Equipment), Ltd., Joseph	46
Mallock-Armstrong Co., The	100
Marconi's Wireless Telegraph Co., Ltd.	67
Marshalls Flying School, Ltd. 97,	98
Marston Excelsior, Ltd.	89
Martin-Baker Aircraft, Ltd.	56
Mining and Chemical Products, Ltd.	60
Mollart Engineering Co., Ltd.	87
Motokov	33
Munro, Ltd., R. W.	89
Napier and Son, Ltd., D.	55
Normalair, Ltd.	34
Oldham and Sons, Ltd.	76
Otter Controls, Ltd.	90
Palmer Tyre Ltd., The	70
Peto and Radford	20
Power Jacks, Ltd.	14
Powis and Sons, Ltd., David	87
Precision Rubber Products (Canada), Ltd.	79
P.S.C. Applied Research, Ltd.	2
Pullin and Co., Ltd., R. B.	99
Pye, Ltd.	77
R. F. D. Co., Ltd.	35
Robinson and Co. (Gillingham), Ltd., L.	88
Roe and Co., Ltd., A. V.	40
Roe Canada, Ltd., A. V. Cover iii,	48
Rollason Aerocessories, Ltd.	93
Rotax, Ltd. Cover i	
Roy Industries, Ltd., E.	89
Sanders (Electronics), Ltd., W. H.	79
Sangamo Weston, Ltd.	66
Saunders Valve Co., Ltd.	81
Self-Priming Pump and Enginering Co., Ltd.	28
Simmonds Aerocessories, Ltd.	3
Skyhi, Ltd.	74
Sperry Gyroscope Co., Ltd.	16
Standard Telephones and Cables, Ltd.	25
State Express Cigarettes	31
Stewart Aeronautical Supply Co., Ltd.	58
Technoimpex	6
Teddington Aircraft Controls, Ltd.	19
Thermal Control Co., Ltd.	72
Thompson Brothers (Bilston), Ltd.	13
Tipping and Co., Ltd., C. R.	91
Triplex Safety Glass Co., Ltd.	78
Tungum Co., Ltd., The	80
Uhlhorn Brothers, Ltd.	100
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Vaughan and Co., Ltd., Edgar	78
Vickers-Armstrongs, Ltd. 37, 45, 96,	99
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V.P. Sheet Metal, Ltd.	21
Walterisation, Ltd.	85
Welsh Metal Industries, Ltd.	8
West and Partners, Ltd., A.	83
Western Manufacturing (Reading), Ltd.	4
Westland Aircraft, Ltd.	1
Whittemore (Aeradio), Ltd., A. J.	95
Whyte and Collins, Ltd.	95
Wiggin and Co., Ltd., Henry	64
Williamson Manufacturing Co., Ltd.	24
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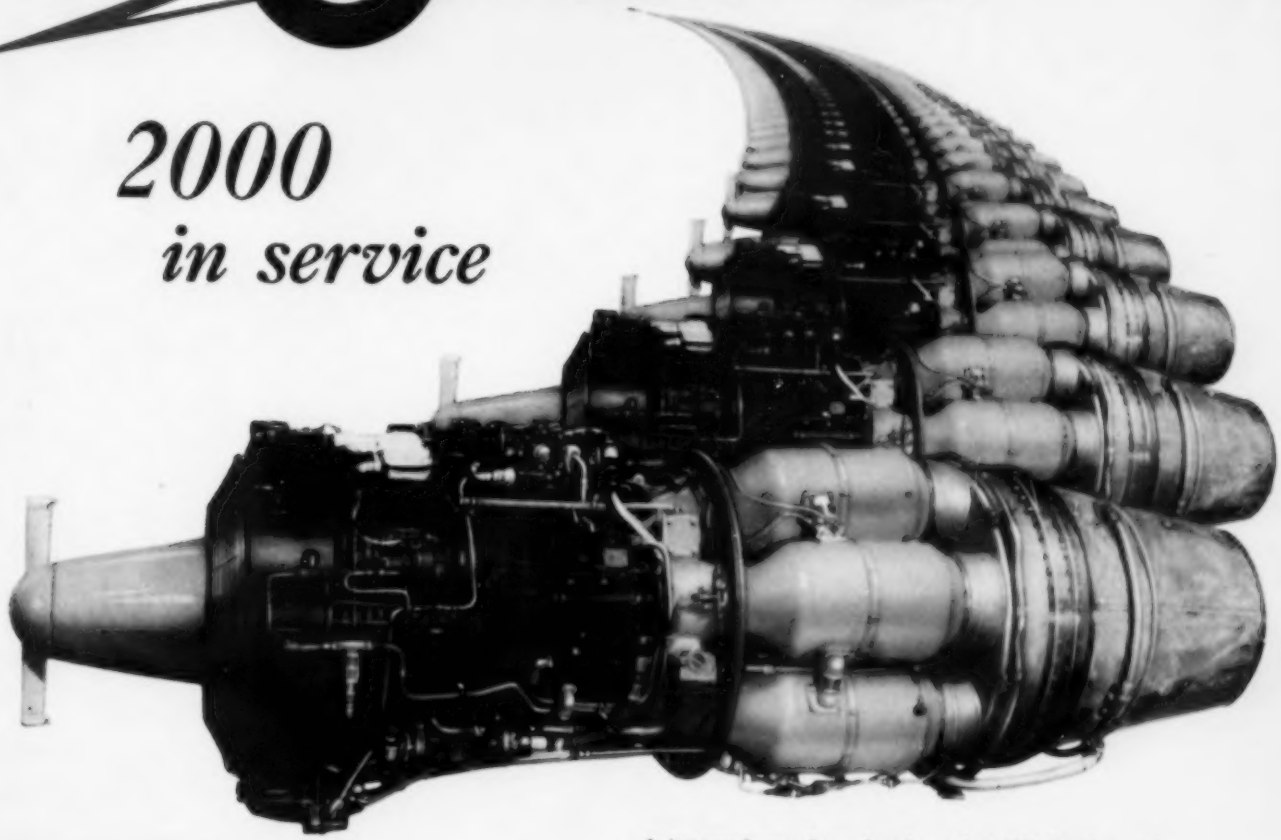

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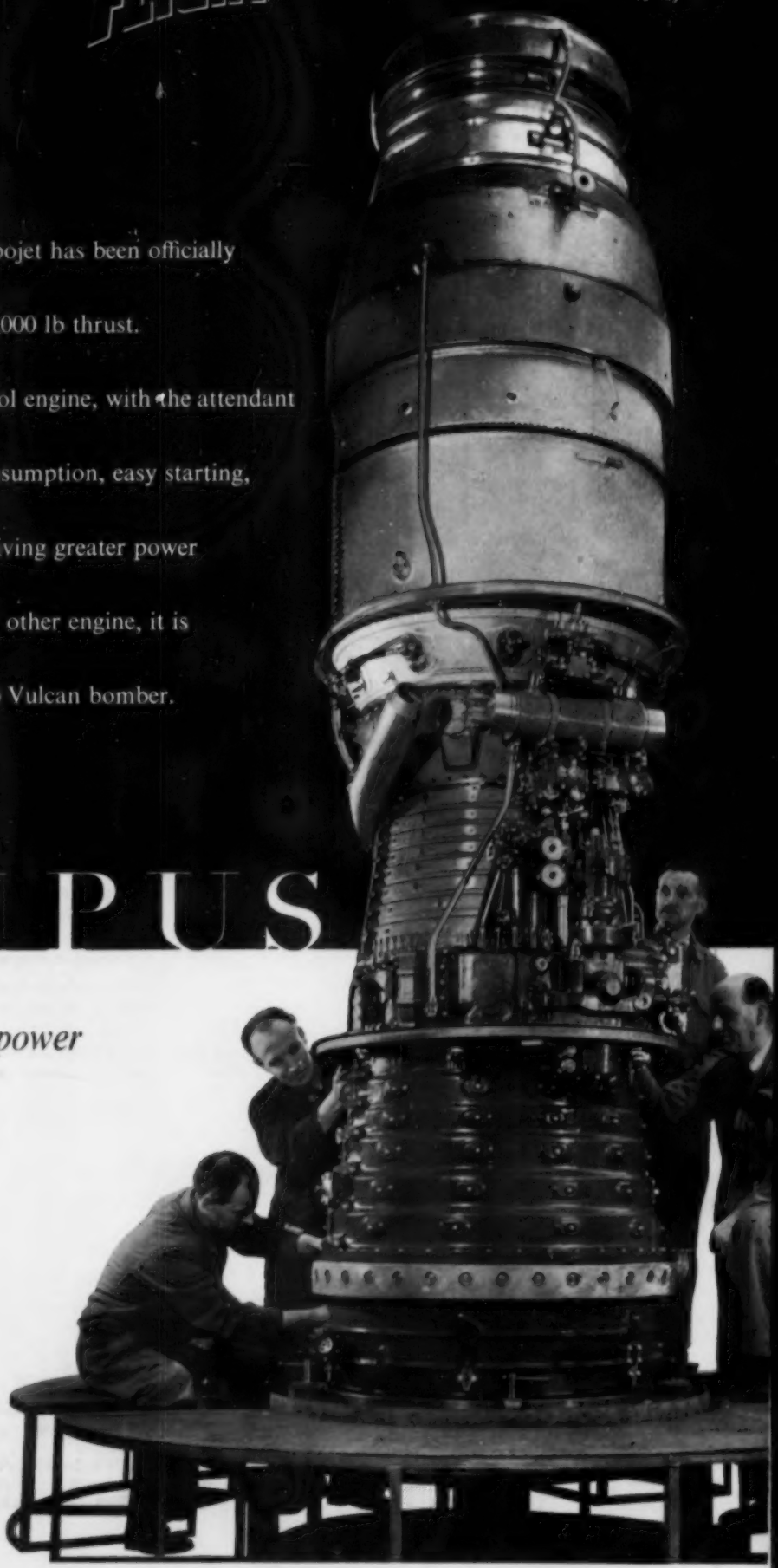

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